Directional seated valve type G

Product documentation

Operating pressure p_{max}:	500 (700) bar
Flow rate Q_{max}:	65 l/min

D 7300
06-2024-1.0 en

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Printing date / document generated on: 2024-07-24

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1 Overview Directional seated valve type G

Directional seated valves are a type of directional valve. Their function is to direct the flow of hydraulic medium in certain directions, therefore connecting the relevant connections, or shutting off the flow with zero leakage. By this means they control the movement of the actuators in a hydraulic system.

The directional seated valve type G is available as a 2/2, 3/2, 4/2, 3/3 and 4/3 directional seated valve with different actuation types and plug types. It is a ball seated valve. Actuation using a hand lever enables switchable pressures of up to 700 bar.

Appropriate connection blocks enable direct pipe connection. The directional seated valves are available as chained valves in a valve bank type VB .

Features and advantages

- Dirt-resistant design with high switching reliability
- Low shifting forces and smooth, shock-free shifting
- Operating pressures up to 700 bar
- Version for HFA fluid

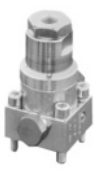
Intended applications

- Machine tools (cutting and non-cutting)
- Clamping tool, punching tools, fixtures
- Rubber and plastics machinery
- Hydraulic tools

Directional seated valve type G

Directional seated valve type G

Actuation types

Electromagnetic		Pressure-actuated		Mechanical		Manual	
G	WG	H	P	K	T	F	D
DC voltage	AC voltage	Hydraulic	Pneumatic	Roller	Pin	Hand lever	Rotary knob
							

2 Available versions

Ordering examples

G H	48 S 2	-22 -2	R-B.. B 1,2	-X 24	-60	/1	T	-Z 15	-3/8 -3/8 C	-500

Pressure setting (bar)

2.6 "Single connection blocks for pipe connection"

2.5 "Adapter plate"

2.4.4 "Manual override"

2.4.3 "Solenoid alignment"

2.4.2 "Screw length"

2.4.1 "Solenoid voltage and connector"

2.3 "Additional elements (can be retrofitted)"

Size 2.1 "Basic type (actuation) and size"

2.2 "Circuit symbol"

Actuation 2.1 "Basic type (actuation) and size"

2.1 Basic type (actuation) and size

Type	Actuation	Pressure p_{max} (bar)									
Size		**0**			**1**		**2**		**22**		**3**	
Circuit symbol	**2/2 directional valves** **3/2 directional valves** **4/2 directional valves** **3/3 directional valves** **4/3 directional valves**	**R2, S2** **3, Z3**	**21**	**22**	**R2, S2** **3, Z3** **4, Z4** **21**	**22**	**R2, S2** **3, Z3** **21**	**22**	**R2, S2** **3, Z3**	**4, Z4** **39** **45, 46, 47, 48, 49**	**R2, S2** **3, Z3** **21**	**22**
G, WG	Electrical (solenoid)	500	500	350	see D 7300-12		500	350	500 (700)	700 **39, 49:** 500 (700)	400	350
H	Pressure	500	500	500	700	500	500	500	700	--	400	400
P		--	--	--	700	400	500	400	700		400	350
K	Mechanical	--	--	--	700	400	500	400	700		400	350
T		--	--	--	700	400	500	400	700		--	--
F	Manual	--	--	--	700	400	500	400	700		400	350
D		500	--	--	700	400	500	--	700		--	--

see Chapter 2.4.5, "Further actuations"

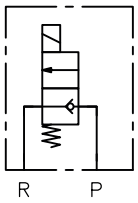
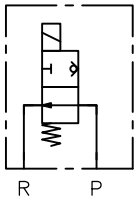
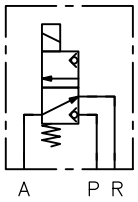
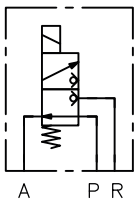
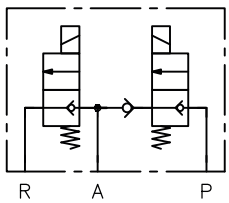
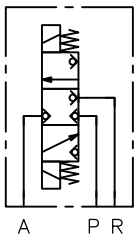
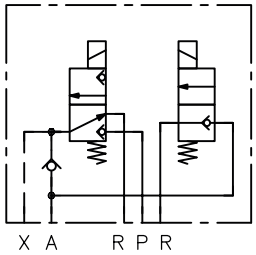
Size	0	1	2	22	3
Flow rate Q_{max} (l/min)	6	12	25	25 **4, Z4:** 20	65

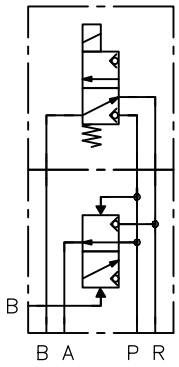
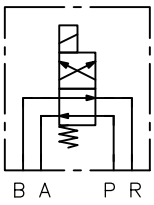
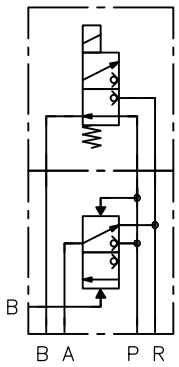
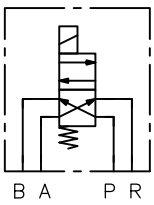
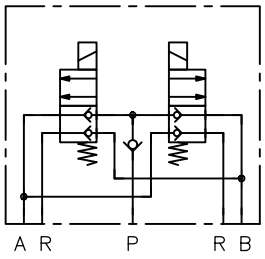
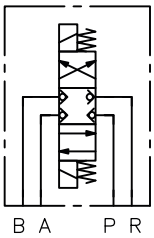
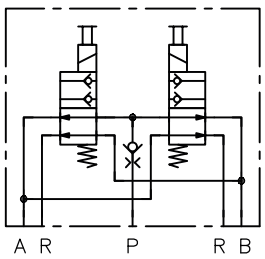
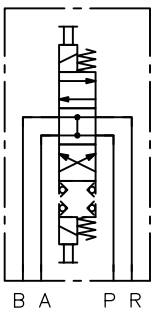
NOTICE

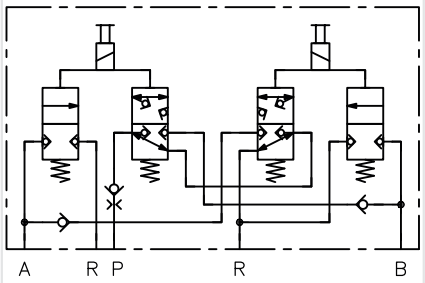
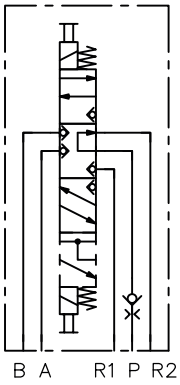
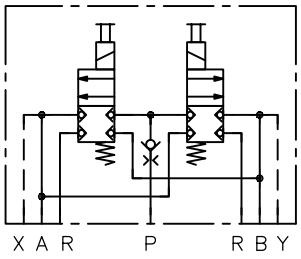
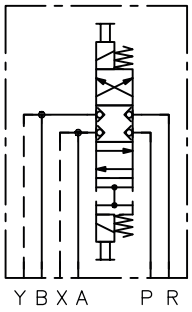
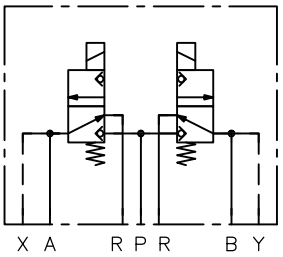
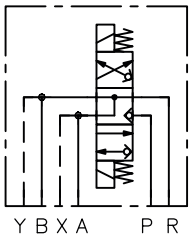
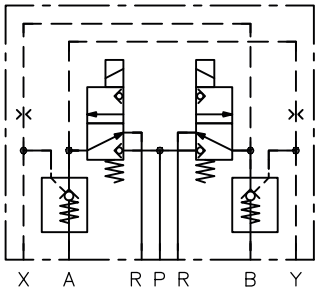
With standard solenoids 12 V DC, 24 V DC, 48 V DC, 98 V DC (110 V AC), 205 V DC (230 V AC)

- Circuit symbols **R2, S2, 3, Z3, 39, 49** size 22:
  Q_{max} = 25 l/min and p_{max} = 500 bar
  Q_{max} = 12 l/min and p_{max} = 700 bar during loading <= 10% duty cycle, ambient temperature ≦ 40°C

2.2 Circuit symbol

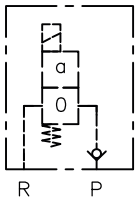
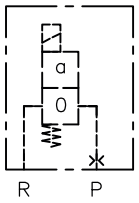
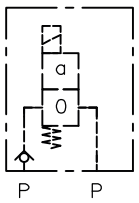
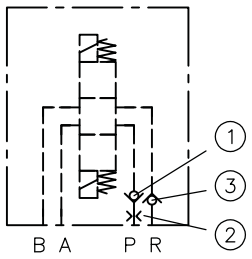
Circuit symbol	Description	Detailed circuit symbols	Circuit symbols	Size				
				0	1	2	22	3
2/2 directional valves								
R 2	▪ N/C contact P → R	--		●	●	●	●	●
S 2	▪ N/O contact P → R	--		●	●	●	●	●
3/2 directional valve								
3	▪ P closed ▪ A → R open	--		●	●	●	●	●
Z 3	▪ R closed ▪ P → A open	--		●	●	●	●	●
3/3 directional valve								
21	▪ P, A, R closed			●	●	●		●
39	▪ P, A, R closed ▪ Control line X relieved						●	

Circuit symbol	Description	Detailed circuit symbols	Circuit symbols	Size				
				0	1	2	22	3
4/2 directional valves								
4	▪ P → A open ▪ B → R open				●		●	
Z 4	▪ P → B open ▪ A → R open				●		●	
4/3 directional valves								
22	▪ P, A, B, R closed			●	●	●		●
45	▪ P, A, B → R open						●	

Circuit symbol	Description	Detailed circuit symbols	Circuit symbols	Size				
				0	1	2	22	3
46	▪ P → R open ▪ A, B closed						●	
47	▪ P, A, B, R closed ▪ Control line X, Y not relieved						●	
48	▪ A/B → R open ▪ P closed ▪ Control line X, Y relieved						●	
49	▪ P, A, B, R closed ▪ Control line X, Y relieved						●	

Pilot ratio with circuit symbol 49, see Chapter 3.2, "Pressure and volumetric flow, pilot ratio"

2.3 Additional elements (can be retrofitted)

Coding	Description	Suitable for circuit symbol	Circuit symbol	Size				
				0	1	2	22	3
without coding	Series	--		●	●	●	●	●
R	Check valve in P (ER according to D 7325) Cannot be combined with **B..** **Size** / **Type**: 0 – ER 01; 1 – ER 11; 2, 22 – ER 21; 3 – ER 31	R 2, S 2 3, Z 3		●	●	●	●	●
		4, Z 4			●			
		22		●	●	●		●
B..	Orifice in P (EB according to D 6465) Cannot be combined with **R** **Size** / **Type** / **Orifices ∅ (mm)**: 0 – EB 0 – 0.6; 0.8; 1.2; 1 – EB 1 – 0.4; 0.6; 0.8; 1.0; 2.0; 2, 22 – EB 2 – 1.2; 1.7; 2.1; 3 – EB 3 – 2.5; 3.5; 4.2	R 2, S 2 3, Z 3		●	●	●	●	●
		21		●	●	●		●
S	Return pressure stop in R Combination with **R** or **B** possible. **Size** / **Order no.**: 0 – 7332 000 a; 1 – 7332 000 b	R 2, S 2 3, Z 3		●	●			
R	Check valve in P (RB according to D 7445) Can be combined with **B..** **Size** / **Type**: 22 – RB 1	45 46 47 48	 1 Check valve **R** 2 Orifice **B..** 3 Return pressure stop **S**				●	
B..	Orifice in P Can be combined with **R** **Size** / **Type** / **Orifices ∅ (mm)**: 22 – 7406 012 E – 0.4; 7406 012 G – 0.5; 7406 012 B – 0.6; 7406 012 C – 0.8; 7406 012 D – 1.1; 7406 012 F – 1.3; 7406 012 H – 1.5; 7406 012 I – 3.0; 7406 012 J – 3.5; 7406 012 K – 4.0	45 46 47 48					●	

Coding	Description	Suitable for circuit symbol	Circuit symbol	Size				
				0	1	2	22	3
S	Return pressure stop in R Combination with R and/or B possible	46						

Size	Type
22	RK 2

Further information see Chapter 6.1.2, "Additional elements for retrofitting"

2.4 Actuation

2.4.1 Solenoid voltage and connector

INFORMATION
For solenoid voltages and connector size 1, see D 7300-12

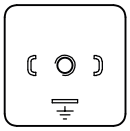
Actuating solenoid - version with compact solenoid

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)	Size		
				0	2, 22	3
G 12	Version with central connector MSD 2 for direct cable connection according to D 7163	12 V DC	IP 54	●		
G 24		24 V DC		●		
G 48		48 V DC		●		
G 98		98 V DC		●		
G 110		110 V DC		●		
G 205		205 V DC		●		
A 12, N 12	Version with adapter MSD 2 - MSD 3 for DIN plug in accordance with EN 175 301-803 A ▪ **A:** without line connector ▪ **N:** with line connector MSD 3-309 in accordance with D 7163	12 V DC	IP 54	●		
A 24, N 24		24 V DC		●		
A 48, N 48		48 V DC		●		
A 98, N 98		98 V DC		●		
A 110, N 110		110 V DC		●		
A 205, N 205		205 V DC		●		
X 12, G 12	Version with DIN plug EN 175 301-803 A ▪ **X:** without line connector ▪ **G:** with line connector	12 V DC	IP 65		●	●
X 24, G 24		24 V DC			●	●
X 48, G 48		48 V DC			●	●
X 98, G 98		98 V DC			●	●
X 110, G 110		110 V DC			●	●
X 205, G 205		205 V DC			●	●
WG 110	Size 0: Version with adapter for DIN plug in accordance with EN 175 301-803 A MSD 2 - MSD 3 and MSD 4-209 P10 Size 2, 22, 3 only with MSD 4-209 P10 according to D 7163	98 V DC / 110 V AC 50/60 Hz	IP 54 (size 0)	●	●	●
WG 230		205 V DC / 230 V AC 50/60 Hz	IP 65 (size 2, 22 and 3)	●	●	●
L 12	▪ **L:** with LED connector ▪ **5K, 10K:** with cast-on cable 5 m, 10 m long as per D 7163	12 V DC	IP 54 (size 0)	●	●	●
L 24		24 V DC		●	●	●
L5K 12		12 V DC	IP 65 (size 2, 22 and 3)	●	●	●
L5K 24		24 V DC		●	●	●
L10K 12		12 V DC		●	●	●
L10K 24		24 V DC		●	●	●

INFORMATION
- The specifications regarding the IP protection class apply for versions featuring a properly assembled male connector.
- Special voltages available on request.

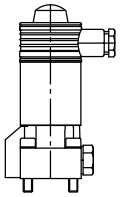
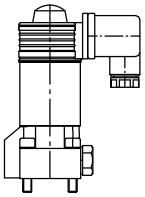
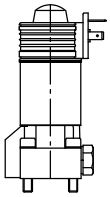
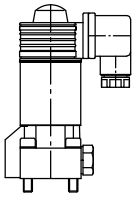
Connection pattern

G .., X .., L(5K), WG ..



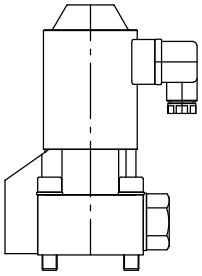
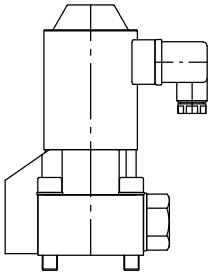
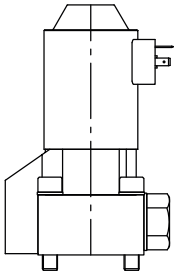
Additional plug options available on request.

Female connectors for valves size 0

G	WG	A	N
			
Central connector (series)	Valve with adapter and rectifier (connector)	Valve with adapter for female connector EN 175 301-803 A	Valve with adapter and female connector EN 175 301-803 A
MSD 2	MSD 2 - MSD 3 + MSD 4-209 P10	MSD 2-MSD 3	MSD 2-MSD 3 + MSD 3-309

Dimensions see Chapter 4.5.1, "Solenoid actuation"

Female connectors for valves sizes 2, 22 and 3

G	WG	X
		

Dimensions see Chapter 4.5.1, "Solenoid actuation"

2.4.2 Screw length

Coding	Description	Length (mm)	with circuit symbol
60	with spacer plate type Z15, see Chapter 2.5, "Adapter plate"	60	G48
85	with intermediate plate type VB 22 - ZQ.., see D 7302-22	85	G48
100		100	G45, G49, G39
105		105	G47
120		120	G46

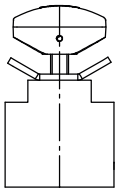
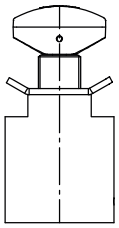
2.4.3 Solenoid alignment

Size **22**

Coding	Description	Circuit symbol		
		G 45, 4, Z 4	G 39, G 49	G 46, G 47, G 48
without coding	Series	●	●	●
/1	Rotated 90°	●		●
/2	Rotated 180°	●		●
/3	Rotated 270°, rotated 120° externally with G 39, G 49	●	●	

2.4.4 Manual override

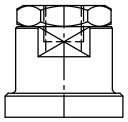
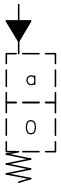
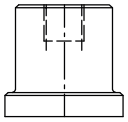
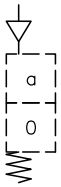
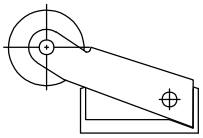
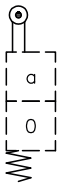
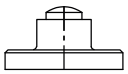
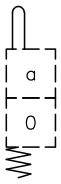
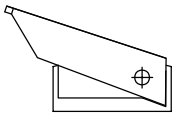
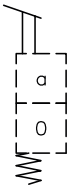
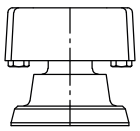
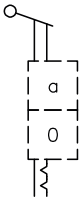
Size **22**

Coding	Description	Suitable for circuit symbol	Illustration
without coding	Series (without)	all	
T	for relieving the consumers	G 46 G 47	
TT	for complete actuation of the valve	G 45 G 46 4, Z 4	

2.4.5 Further actuations

INFORMATION

- Size 22: only circuit symbol R, S, 3, Z 3

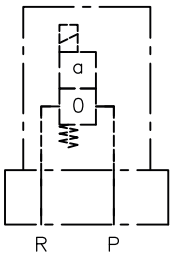
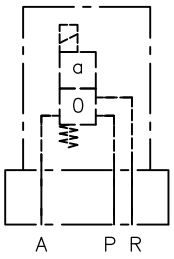
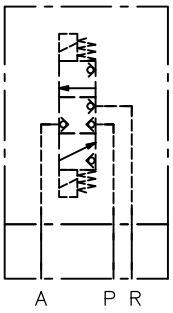
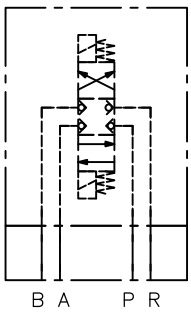
Coding	Actuation		Circuit symbol	Size				
				0	1	2	22	3
H	Hydraulic			●	●	●	●	●
P	Pneumatic				●	●	●	●
K	Mechanical (sensing roller)				●	●	●	●
T	Mechanical (sensing pin)				●	●	●	
F	Manual (sensing lever)				●	●	●	●
D	Manual (rotary knob)			●	●	●	●	

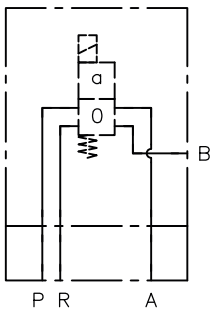
For further technical data, see Chapter 3.6, "Technical data - Further actuations"

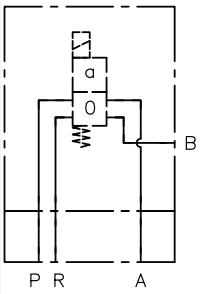
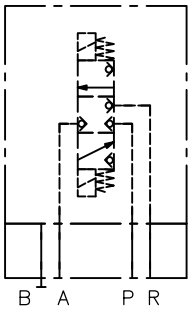
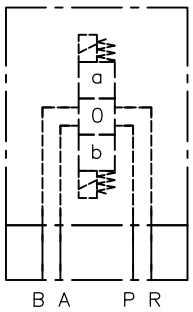
2.5 Adapter plate

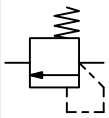
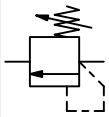
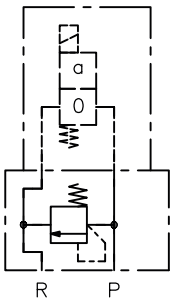
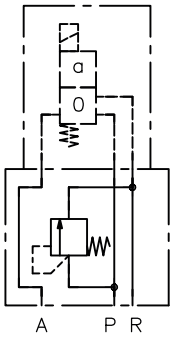
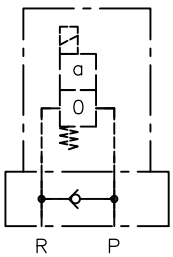
Coding	Description	Size				
		0	1	2	22	3
Z 15	For circuit symbol 48 and when using in a valve bank with shuttle valves and idle circulation valve: spacer plate Z 15 is used to shut off the *X- and Y duct*. It prevents leakage through the A- and B-duct.				●	

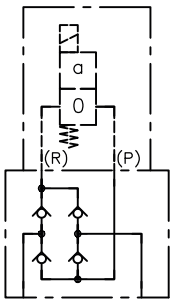
2.6 Single connection blocks for pipe connection

Coding	Ports (ISO 228-1) P, A, B, R	Description	suitable for circuit symbol	Circuit symbol	Size				
					0	1	2	22	3
-1/4	G 1/4	Connection block for pipe connection Suitable for parallel and series connection, taking into account the permissible load capacity of the ports P, A, B and R see Chapter 3.1, "General data"	R 2, S 2 3, Z 3 21 22	2/2 directional valve **R 2, S 2**  3/2 directional valve **3, Z 3**  3/3 directional valve **21**  4/3 directional valve **22**  	●	●			
-3/8	G 3/8					●	●	●	
-1/2	G 1/2						●	●	●
-3/4	G 3/4								●

Coding	Ports (ISO 228-1) P, A, B, R	Description	suitable for circuit symbol	Circuit symbol	Size				
					0	1	2	22	3
-1/4	G 1/4		4, Z4	4/2 directional valve **4, Z 4** 		●			

Coding	Ports (ISO 228-1) P, A, B, R	Description	suitable for circuit symbol	Circuit symbol	Size				
					0	1	2	22	3
-3/8	G 3/8	Connection block for pipe connection Suitable for parallel and series connection, taking into account the permissible load capacity of the ports P, A, B and R see Chapter 3.1, "General data"	4, Z 4 39 45, 46, 47, 48, 49	4/2 directional valve **4, Z 4**  3/3 directional valve **39**  4/3 directional valve **45, 46, 47, 48, 49** 				●	

Coding	Ports (ISO 228-1) P, A, B, R	Description	Suitable for circuit symbol	Circuit symbol	Size				
					0	1	2	22	3
-1/4 S **-1/4 SR**	G 1/4	Connection block for pipe connection with pressure-limiting valve, type MVE 4 according to D 7000/1 **../..S** fixed  **../..SR** manually adjustable (wing nut)  Port R only reflux (pressureless) to ensure the function of the pressure-limiting valve.	R 2, S 2 3, Z 3	2/2 directional valve **R 2, S 2**  3/2 directional valve **3, Z 3**  		●			
-3/8 S **-3/8 SR**	G 3/8					●			
		Pressure ranges **Coding** / **Valve size** / **Pressure p_{max} (bar)** -1/4 S(R) / 1 / (0) to 100 -3/8 S(R) / 1 / (0) to 200 (0) to 400 (0) to 700 Thanks to the pressure specification in the order coding, the pressure range and the valve seats (size 1) are specified.							
-1/4 C	G 1/4	Connection block for pipe connection with bypass check valve A bypass check valve is required if there should be flow in the direction R to P. Avoid pressure surges (decompression surges) in direction R to P!	R 2, S 2	2/2 directional valve **R 2, S 2**  	●	●			
-3/8 C	G 3/8					●	●	●	
-1/2 C	G 1/2						●	●	

Coding	Ports (ISO 228-1) P, A, B, R	Description	Suitable for circuit symbol	Circuit symbol	Size				
					0	1	2	22	3
-1/4 G	G 1/4	Connection block for pipe connection with check valves in Graetz circuit The Graetz circuit enables the function utilisation of the 2/2 directional valve in both flow directions. The ports P and R are completely equivalent here and therefore not specifically marked on the connection block. **NOTICE** p_{max} = 500 bar!	R 2, S 2	2/2 directional valve **R 2, S 2** 	●	●			
-3/8 G	G 3/8						●	●	

3 Parameters

3.1 General data

Designation	2/2, 3/2, 3/3, 4/3 and 4/2 directional seated valves
Design	Ball seated valve
Model	Manifold mounting valve
Material	Steel; Electro-galvanised valve housing; Hardened and ground functional inner parts; Coil housing zinc-nickel coated or electro-galvanised
Attachment	Base plate assembly without/with connection block
Overlap	Negative, transition from one flow direction to the other is completed only at the stroke end position. During switching, all passages are connected to each other.
Installation position	Any; vertical with actuation upwards preferred
Flow direction	Only in direction of arrow according to circuit symbol see Chapter 2.1, "Basic type (actuation) and size". The ports P (pump connection), R (reflux), A and B (consumer) are determined by the internal action of the valve and cannot be changed.
Hydraulic fluid	Hydraulic fluid, according to DIN 51 524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 4 - 800 mm²/s Optimal operating range: approx. 10 - 200 mm²/s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.
Cleanliness level	**ISO 4406** 21/18/15...19/17/13
Temperatures	Environment: approx. -40 to +80 °C, hydraulic fluid: -25 to +80 °C, pay attention to the viscosity range. Start temperature: down to -40 °C is permissible (take account of the start viscosities!), as long as the steady-state temperature is at least 20 K higher during subsequent operation. Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C. **NOTICE** Observe the correct duty cycle, see Chapter 3.5, "Electrical data".
Outdoor use	Comparative protection type of mechanical part IP 40 (EN 60529)

3.2 Pressure and volumetric flow, pilot ratio

Operating pressure	see Chapter 2.1, "Basic type (actuation) and size" All ports can be loaded with full operating pressure, but the pressure drop always in the direction of the arrow according to the circuit symbol, i.e. pressure at P to A(B) to R. R only reflux for: ▪ 4/2 directional valve circuit symbol 4 and Z4, ▪ 3/3 directional valve circuit symbol 39 ▪ 4/3 directional valve circuit symbol 22, 45, 46, 47, 48, 49 For increased switchable pressures, see Chapter 2.1, "Basic type (actuation) and size"
Flow rate	see Chapter 2.1, "Basic type (actuation) and size" Minimum flow rate for 4/2 directional valves size 1 = 2 l/min
Pilot ratio	1:4.56 (circuit symbol 49)

3.3 Weight

Valve

Weight in kg

Actuation		2/2 and 3/2 directional valves					3/3 directional valve			
		Size								
		0	1	2	22	3	1	2	22	3
electrical (solenoid)	G	0.4	0.65	1.2	1.8	3.1	0.8	1.4	3.6	2.9
	WG	0.4	0.7	1.2	1.9	3.1	0.8	1.5	3.7	2.9
Hydraulic	H	0.4	0.5	1.1	--	2.8	0.8	1.1	--	2.7
Pneumatic	P	0.4	0.4	0.9	--	2.2	--	0.9	--	2.3
Mechanical	K	--	0.4	0.8	--	2.0	--	0.9	--	2.1
	T	--	0.4	0.8	--	--	--	0.9	--	2.1
Manual	F	--	0.4	0.8	--	2.0	--	0.9	--	2.1
	D	0.4	0.4	0.9	--	--	0.8	0.9	--	2.2

Actuation		4/2 directional valve		4/3 directional valve				
		Size						
		1	22	0	1	2	22	3
electrical (solenoid)	G	1.9	2.0	0.9	1.6	3.0	4.0	6.0
	WG	2.0	2.1	0.9	1.7	3.1	4.1	6.0
Hydraulic	H	1.8	--	0.8	1.3	2.8	--	5.3
Pneumatic	P	1.7	--	--	1.1	5.4	--	4.2
Mechanical	K	1.7	--	--	1.1	5.2	--	3.8
	T	1.6	--	--	1.0	5.2	--	--
Manual	F	1.7	--	--	1.1	5.2	--	3.8
	D	1.7	--	0.8	1.1	5.3	--	--

Single connection block

Coding	Size				
	0	1	2	22	3
-1/4, -3/8, -1/2, -3/4 for pipe connection	0.2	0.5	1.0	1.0	1.2
-..S(SR) with pressure-limiting valve	0.4	1.2	1.6	1.6	--
-..C with bypass check valve	0.2	0.5	1.0	1.0	--
-..G with Graetz circuit	0.5	0.7	1.0	1.0	2.4

Coding	4/2 directional valve	4/3 directional valve 3/3-directional valve
	Size 22	
-3/8 for pipe connection	1.1	1.7

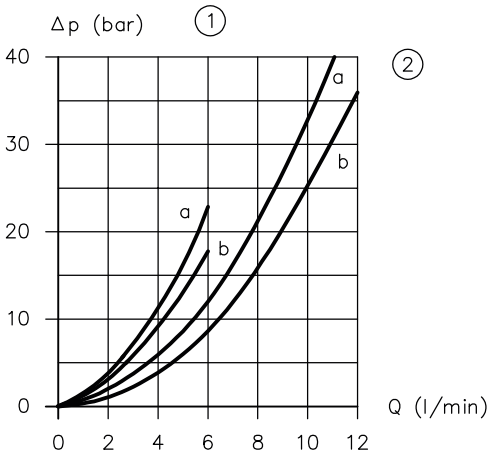
3.4 Characteristic lines

Viscosity of the hydraulic fluid approx. 60 mm²/s

Δp-Q characteristic lines

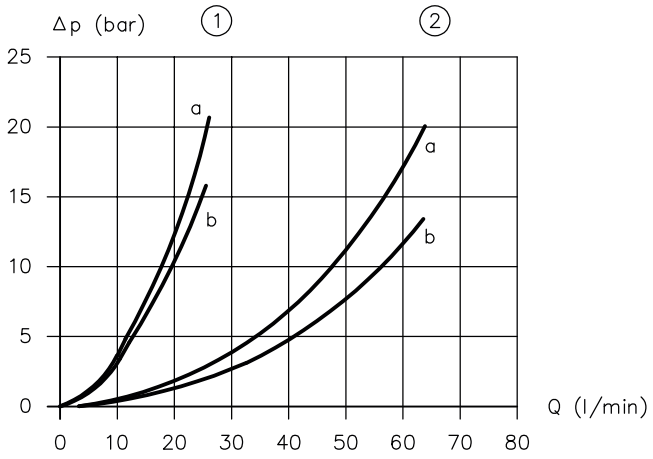
Basic valve

2/2 and 3/2 directional valves



Q flow rate (l/min); Δp flow resistance (bar)

1 Size 0
2 Size 1

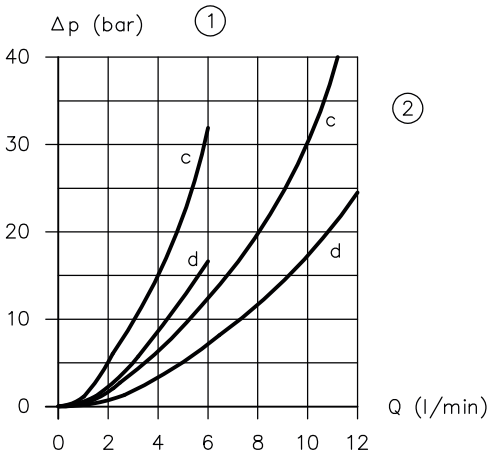


Q flow rate (l/min); Δp flow resistance (bar)

1 Size 2, 22
2 Size 3

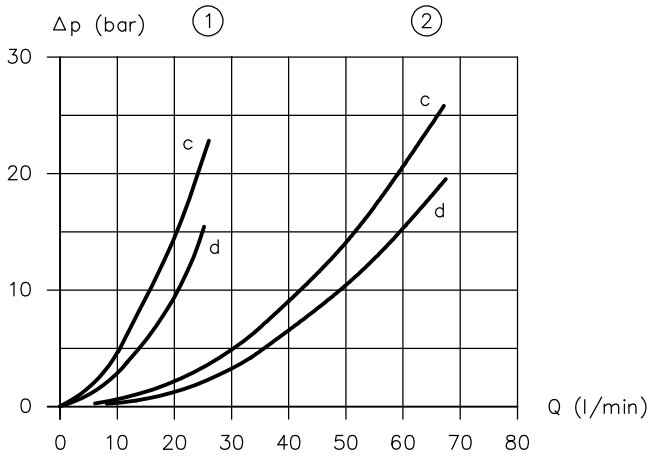
Curve a: P → A and A → R
Curve b: P → R

3/3, 4/3 and 4/2 directional valves



Q flow rate (l/min); Δp flow resistance (bar)

1 Size 0
2 Size 1

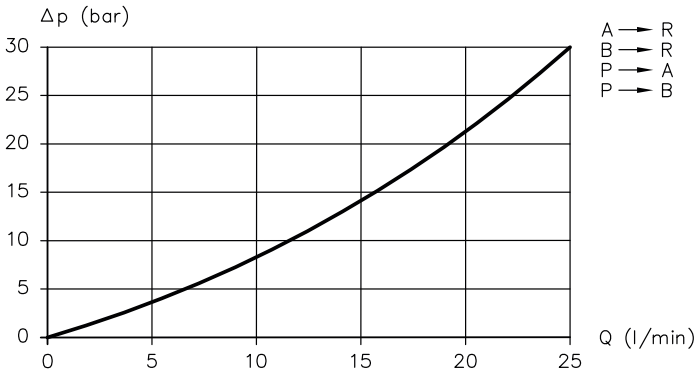


Q flow rate (l/min); Δp flow resistance (bar)

1 Size 2
2 Size 3

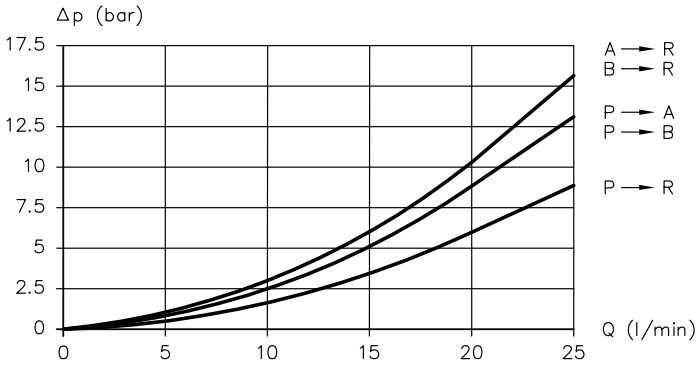
Curve c: P → A(B)
Curve d: A(B) → R

G 39-22, G 49-22 (rough reference values)



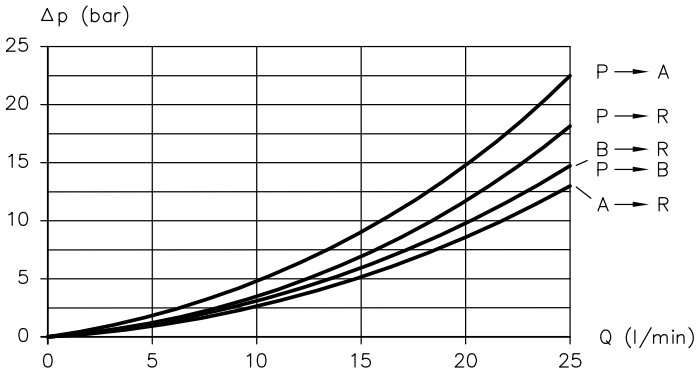
Q flow rate (l/min); Δp dynamic pressure (bar)

G 45-22



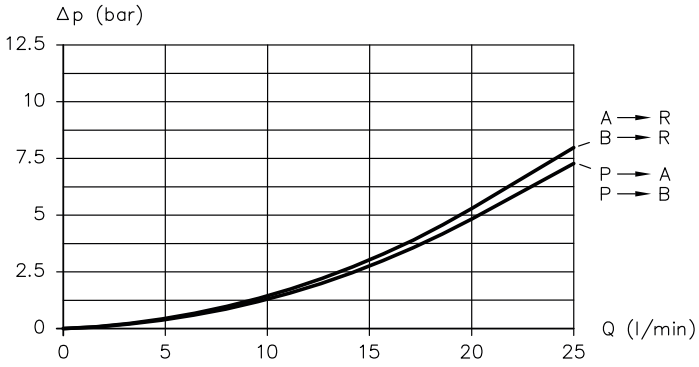
Q flow rate (l/min); Δp dynamic pressure (bar)

G 46-22



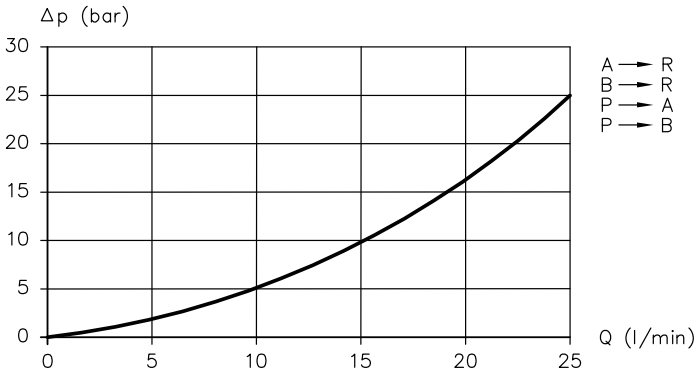
Q flow rate (l/min); Δp dynamic pressure (bar)

G 47-22



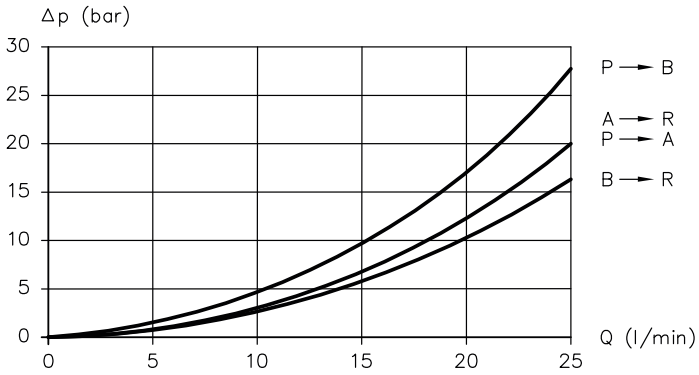
Q flow rate (l/min); Δp dynamic pressure (bar)

G 48-22



Q flow rate (l/min); Δp dynamic pressure (bar)

G 4-22, GZ 4-22

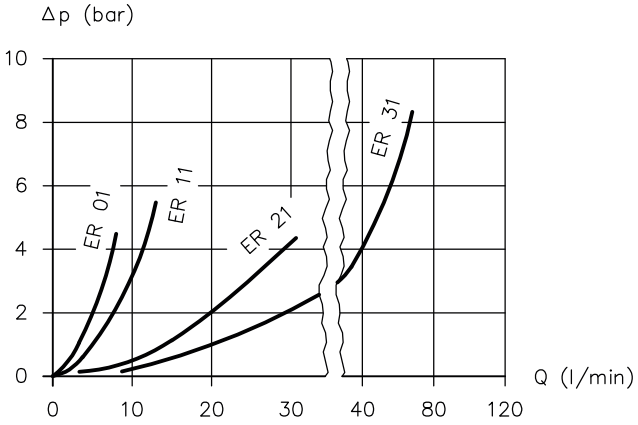


Q flow rate (l/min); Δp dynamic pressure (bar)

Additional elements

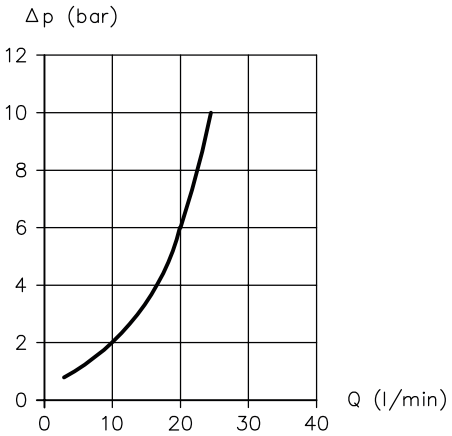
Check valves

Type and size, see Chapter 2.3, "Additional elements (can be retrofitted)"



Q flow rate (l/min); Δp flow resistance (bar)

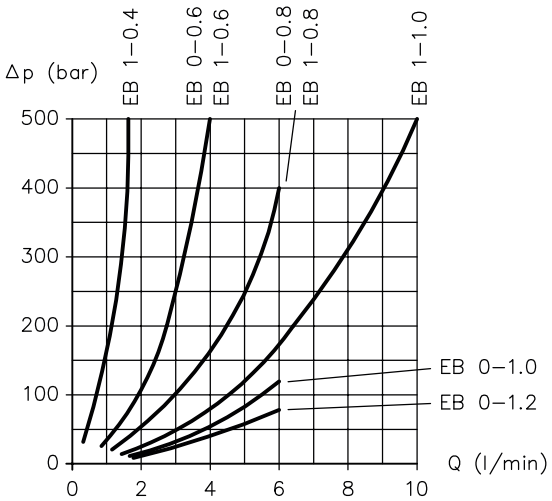
RB 1



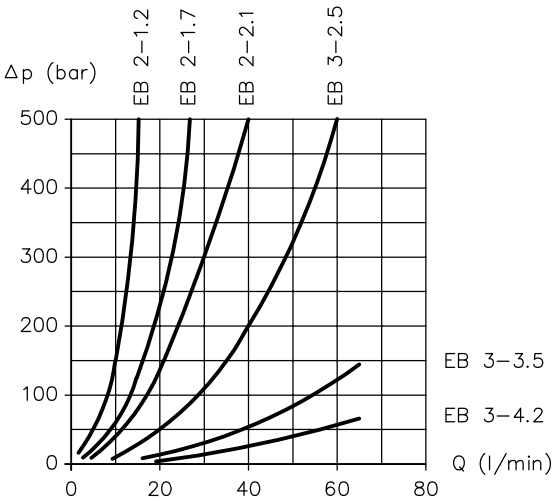
Q flow rate (l/min); Δp dynamic pressure (bar)

Orifices

Type and size, see Chapter 2.3, "Additional elements (can be retrofitted)"



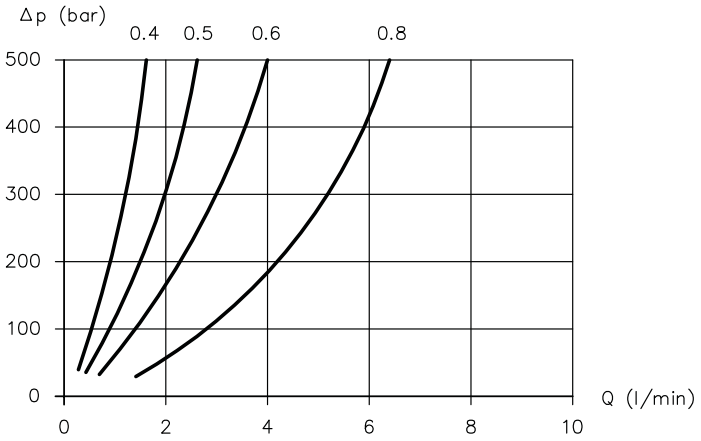
Q flow rate (l/min); Δp flow resistance (bar)



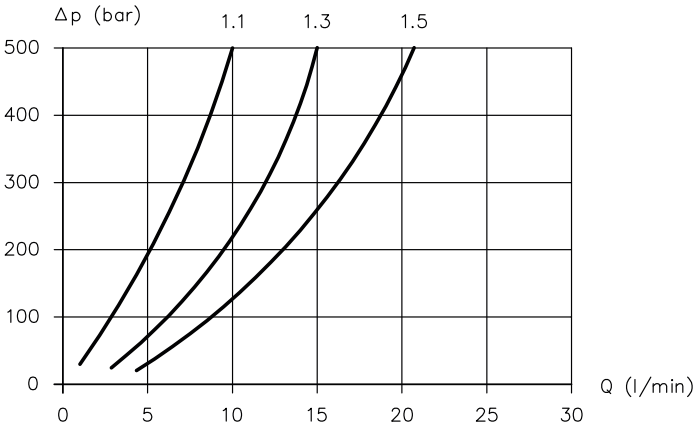
Q flow rate (l/min); Δp flow resistance (bar)

Orifices for circuit symbol 45, 46, 47, 48

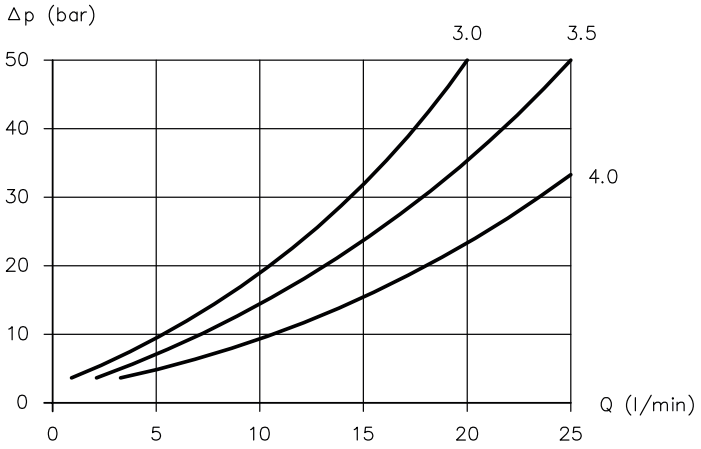
Size 22, see Chapter 2.3, "Additional elements (can be retrofitted)"



Q flow rate (l/min); Δp flow resistance (bar)



Q flow rate (l/min); Δp flow resistance (bar)

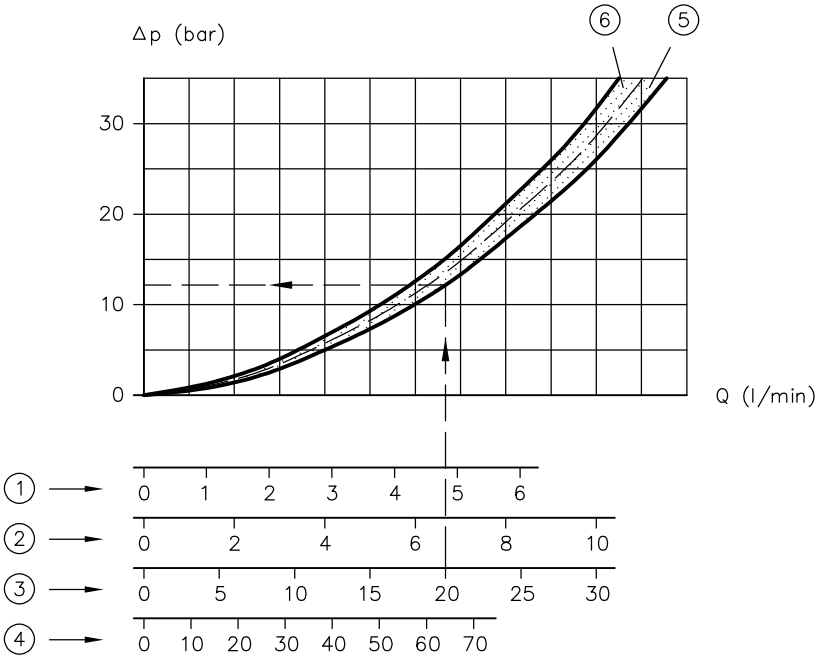


Q flow rate (l/min); Δp flow resistance (bar)

Connection plates

Coding **-1/4, -3/8, -1/2, -3/4, -..S(R)**

Flow direction P → R



Q flow rate (l/min); Δp flow resistance (bar)

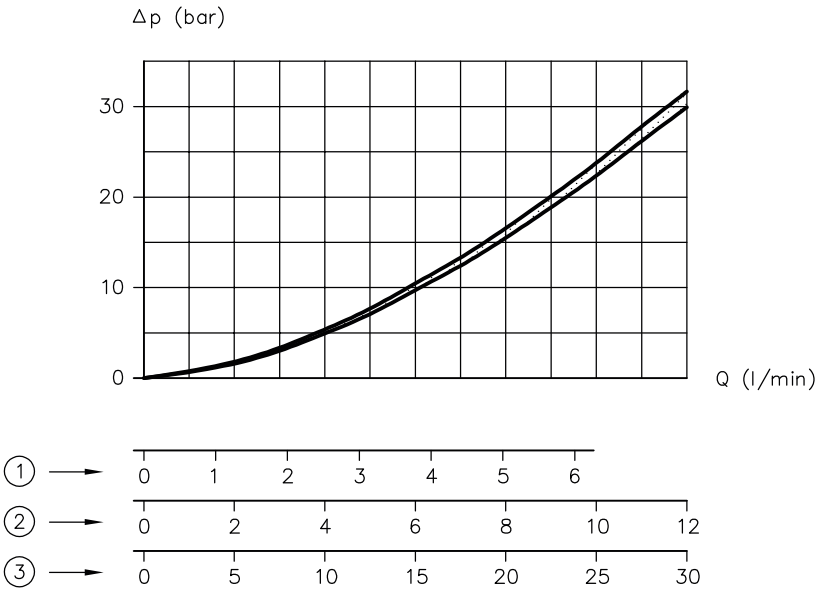
1 Valve, size 0
2 Valve, size 1
3 Valve, size 2, 22
4 Valve, size 3
5 2/2-way directional valve P → R
6 3/2- and 4/2-way directional valve P → A, A → R

Example:
20 l/min flows through a **GR 2-2-1/2-G 24**:
$\Delta P_{P \rightarrow R} \approx 12 \ldots 14$ bar

NOTICE
Characteristic lines for connection blocks coding **-3/8** of the circuit symbols **4, Z4, 39, 45, 46, 47, 48, 49** size 22 are in preparation.

Coding **-..G**

Flow direction P → R (R → P)

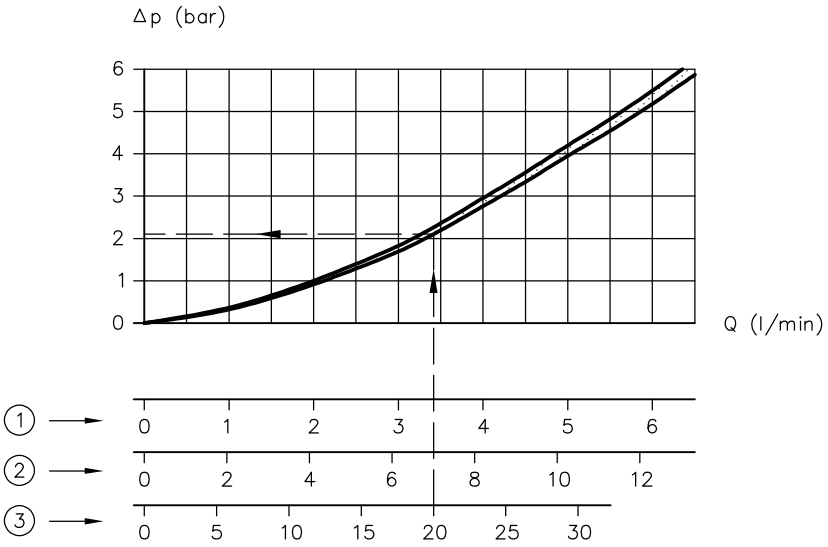


Q flow rate (l/min); Δp flow resistance (bar)

1 Valve, size 0
2 Valve, size 1
3 Valve, size 2, 22

Coding **-..C**

Flow direction R → P



Q flow rate (l/min); Δp flow resistance (bar)

1 Valve, size 0
2 Valve, size 1
3 Valve, size 2, 22

Example:
20 l/min flows through a **GR 2-2-1/2 C-G 24**:
$\Delta P_{R \rightarrow P} \approx 2$ bar

3.5 Electrical data

3.5.1 Electrical data for a standard solenoid

The solenoids are built and tested to DIN VDE 0580.

INFORMATION

- Observe the correct duty cycle, see D 7300, D 7300-12!
- Outdoor use, comparative protection class for mechanical part IP 40 (EN 60529)

Size 0

Coding	G 12 X 12 L 12 L5K 12	G 24 X 24 L 24 L5K 24	G 48 X 48	G 98 X 98	G 205 X 205
Circuit symbol R2, S2, 3, Z3, 21, 22					
Nominal voltage U_N	12 V DC	24 V DC	48 V DC	98 V DC	205 V DC
Nominal power P_N	15 W	15.8 W	14.9 W	15.7 W	16.4 W
Nominal current I_N	1.25 A	0.66 A	0.31 A	0.16 A	0.08 A
Switching times (reference value)	on: 40 ms	off: 40 ms, WG version 2-3 times higher			
Cut-off energy (reference value)	16 Ws				

Size 2

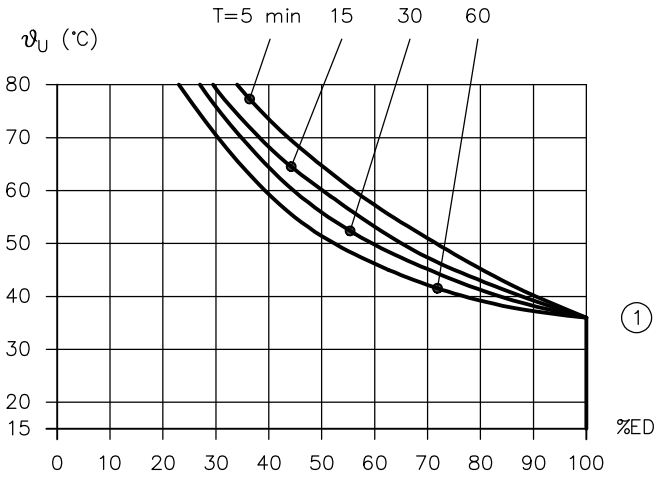
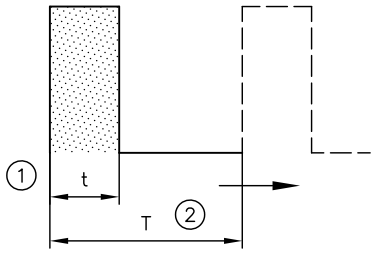
Coding	G 12 X 12 L 12 L5K 12	G 24 X 24 L 24 L5K 24	G 48 X 48	G 98 X 98	G 205 X 205
Circuit symbol R2, S2, 3, Z3, 21, 22					
Nominal voltage U_N	12 V DC	24 V DC	48 V DC	98 V DC	205 V DC
Nominal power P_N	26.7 W	28.8 W	29.2 W	26.7 W	28.5 W
Nominal current I_N	2.2 A	1.2 A	0.61 A	0.27 A	0.14 A
Switching times (reference value)	on: 140 ms	off: 55 ms, WG version 2-3 times higher			
Cut-off energy (reference value)	38 Ws				

Size 22

Coding	G 12 X 12 L 12 L5K 12	G 24 X 24 L 24 L5K 24	G 48 X 48	G 98 X 98	G 205 X 205
Circuit symbol R2, S2, 3, Z3, 39, 49					
Nominal voltage U_N	12 V DC	24 V DC	48 V DC	98 V DC	205 V DC
Nominal power P_N	26.7 W	28.8 W	29.2 W	26.7 W	28.5 W
Nominal current I_N	2.2 A	1.2 A	0.61 A	0.27 A	0.14 A
Switching times (reference value)	on: 140 ms	off: 55 ms, WG version 2-3 times higher			
Cut-off energy (reference value)	38 Ws				
Circuit symbol 48					
Nominal voltage U_N	--	24 V DC	--	98 V DC	205 V DC
Nominal power P_N	--	32 W	--	34.3 W	28.5 W
Nominal current I_N	--	1.33 A	--	0.35 A	0.15 A
Switching times (reference value)	on: 60 ms	off: 20 ms, WG version 2-3 times higher			
Cut-off energy (reference value)	38 Ws				
Circuit symbol 4, Z4, 45, 46, 47					
Nominal voltage U_N	12	24	--	98	205
Nominal power P_N	34.3 W	34.1 W	--	34.8 W	35.1 W
Nominal current I_N	2.86 A	1.42 A	--	0.35 A	0.17 A
Switching times (reference value)	on: approx. 55 ms	off: approx. 15 ms, WG version 2-3 times higher			
Cut-off energy (reference value)	38 Ws				

Size 3

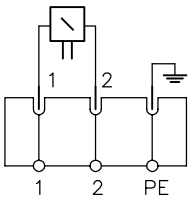
Coding	G 12 X 12 L 12 L5K 12	G 24 X 24 L 24 L5K 24	G 48 X 48	G 98 X 98	G 205 X 205
Circuit symbol R2, S2, 3, Z3, 21, 22					
Nominal voltage U_N	12 V DC	24 V DC	48 V DC	98 V DC	205 V DC
Nominal power P_N	49.7 W	50.1 W	50.1 W	46.8 W	52.5 W
Nominal current I_N	4.14 A	2.1 A	1.04 A	0.48 A	0.26 A
Switching times (reference value)	on: 175 ms	off: 65 ms, WG version 2-3 times higher			
Cut-off energy (reference value)	1.59 Ws				

Switching operations	Approx. 2000/h, to be seen as approximately evenly distributed
Insulation material class	F
Contact temperature	Contact temperature at 20°C, ambient temperature: approx. 85°C ... 95°C (cladding). In adhering to the reference values for % duty cycle in operation, the permissible winding limit temperature of approx. 150°C according to insulation material class F is approximately reached as a steady-state temperature.
Relative duty cycle 100% duty cycle (specified on solenoid)	 *% duty cycle; ϑU ambient temperature (°C)* 1 Version for size 0 to 3  Relative duty cycle $t_r = \frac{t_{on}}{T} \cdot 100\left(\%\,ED\right)$ 1 t on (switch-on time) 2 T (cycle time) **NOTICE** The thermal load on the coil can be reduced by means of an economy circuit, for example. For block circuits and ambient temperatures higher than 40°C, avoid placing solenoid valves that are switched on for long periods directly alongside each other!
Protection class	Depending on the actuating solenoid see Chapter 2.4.1, "Solenoid voltage and connector"
Electrical connection	Depending on the actuating solenoid see Chapter 2.4.1, "Solenoid voltage and connector"

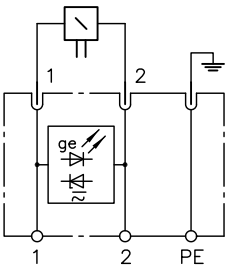
Circuit diagrams

DC voltage

G .., X ..

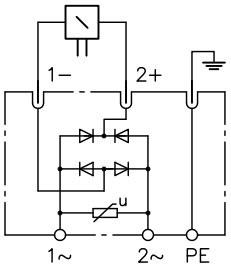


L ..



AC voltage

WG ..



NOTICE

For other connectors, such as those with clamp diodes, economy circuits or LEDs, see D 7163

3.6 Technical data - Further actuations

INFORMATION

- Outdoor use, comparative protection class for mechanical part IP 40 (EN 60529)

Coding	Actuation	Description
H	Hydraulic	The actuating element is a single-acting pilot piston with a spring return. The switching position a is maintained as long as the pilot pressure is present. If the pilot pressure is relaxed to < 1 bar the valve automatically reverts to the default position 0. The pilot piston is sealed for zero leakage.

Size		0	1	2, 22	3
Pilot pressure	max	500 bar	700 bar	500 bar	400 bar
	min	16 bar	12 bar	9 bar	9 bar
Pilot volume		0.2 cm^3	0.4 cm^3	0.7 cm^3	6.1 cm^3
Temperature		-40 to +80°C (ambient and pilot medium)			

Dimensions see Chapter 4.5.2, "Further actuations"

P	Pneumatic	The actuating element is a single-acting pilot piston with a spring return. The switching position a is maintained as long as the pilot pressure is present. If the pilot pressure is released the valve automatically reverts to the default position 0. The pilot piston is sealed.

Size		1	2, 22	3
Pilot pressure	max	15 bar	15 bar	15 bar
	min	4 bar	2.5 bar	2.5 bar
Pilot volume		1 cm^3	2.5 cm^3	7 cm^3
Temperature		-20 to +70°C (ambient and pilot medium)		

Dimensions see Chapter 4.5.2, "Further actuations"

K	mechanical	The actuating element is a roller with spring return which is controlled horizontally. The valve is in switching position a when the actuating element is depressed by the means of actuation over the range of the stroke travel (for the dimensions see Chapter 4.5.2, "Further actuations").

Size	1	2, 22	3
Switching force	25 to 28 N	42 to 47 N	55 to 80 N
Switching travel	Dimensions see Chapter 4.5.2, "Further actuations"		

T		The actuating element is a pin with spring return which is controlled vertically. The valve is in switching position a when the actuating element is depressed by the means of actuation over the range of the stroke travel (for the dimensions see Chapter 4.5.2, "Further actuations").

Size	1	2, 22
Switching force	51 to 57 N	95 to 120 N
Switching travel	Dimensions see Chapter 4.5.2, "Further actuations"	

F	Manual	The actuating element is a sensing lever which acts on a sensing pin that is equipped with a return spring. Switching position a is maintained as long as the sensing lever is depressed.

Size	1	2, 22	3
Switching force	25 to 28 N	42 to 47 N	55 to 80 N
Switching travel	Dimensions see Chapter 4.5.2, "Further actuations"		

Coding	Actuation	Description
D		Actuating element with detent position. The switching position a or 0 is achieved by rotating the knob a further 90° in any direction.

Size	0	1	2, 22
Switching torque	45 Ncm	63 Ncm	98 Ncm
Switching travel	Dimensions see Chapter 4.5.2, "Further actuations"		

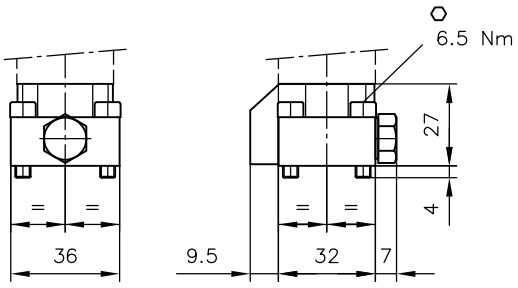
4 Dimensions

All dimensions in mm, subject to change.

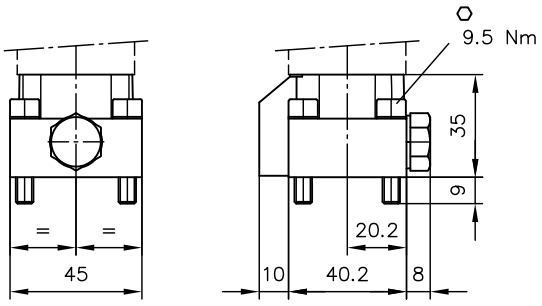
4.1 2/2 and 3/2 directional valves

Circuit symbol **R 2, S 2, 3, Z 3**

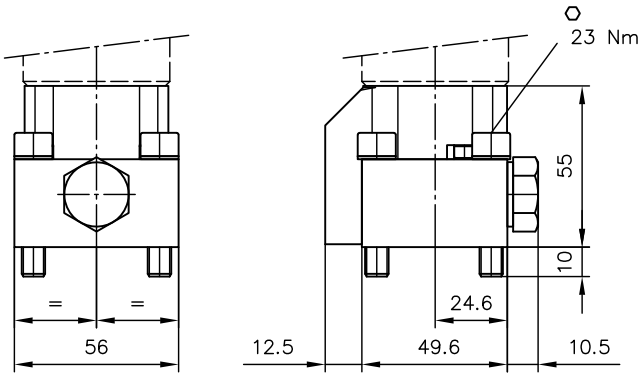
Size **0**



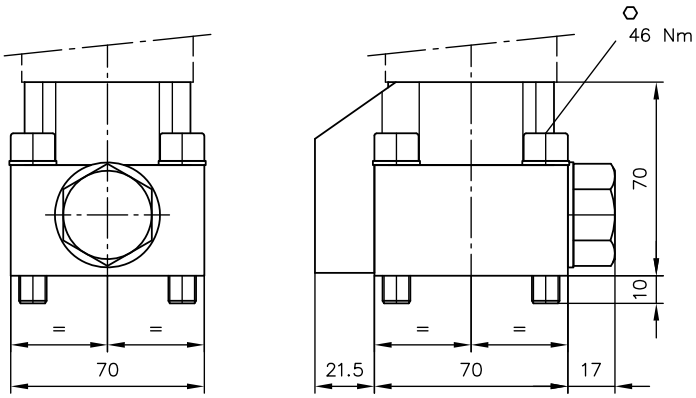
Size **1**



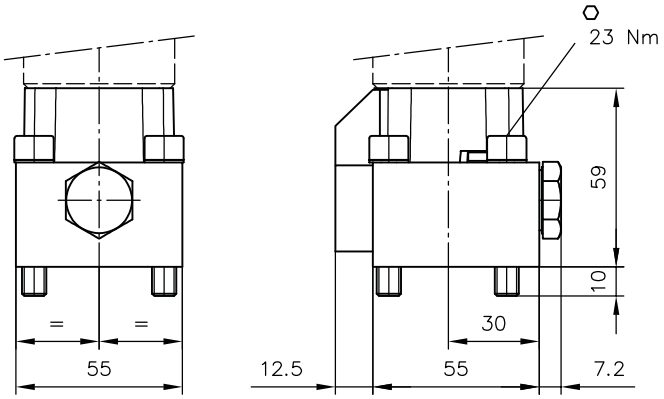
Size **2**



Size **3**



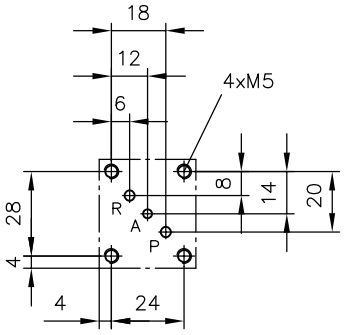
Size **22**

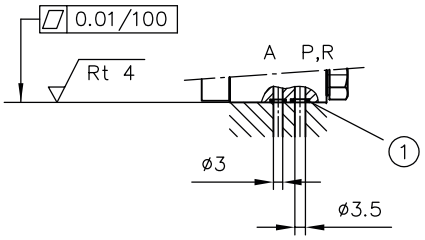


Hole pattern of the base plate

NOTICE
For 2/2 directional valves, port A is not present.

Size **0**

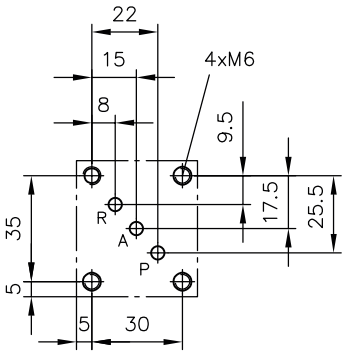


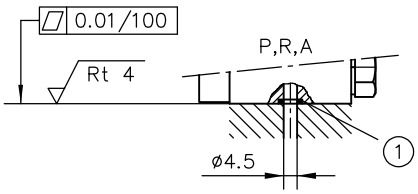


1 O-ring

Ports	O-ring NBR 90 Sh
P, R	6x1.5
A	3.5x1.2

Size **1**

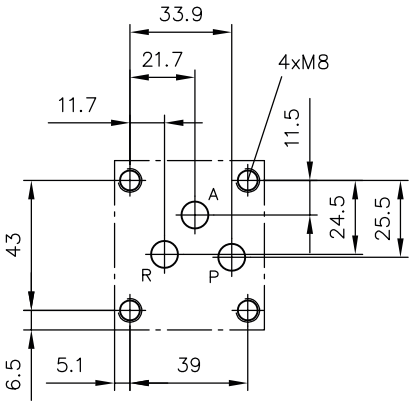


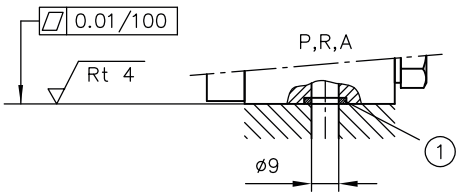


1 O-ring

Ports	O-ring NBR 90 Sh
P, R	8x1.5
A	5x1.5

Size **2, 22**

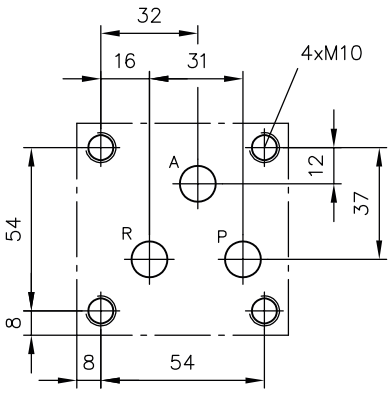


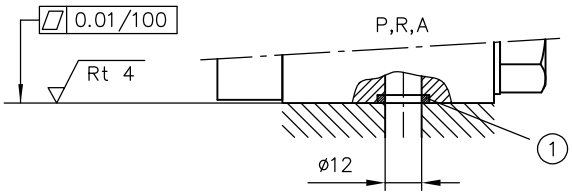


1 O-ring

Ports	O-ring NBR 90 Sh
P	14x2
A, R	10x2.2

Size **3**





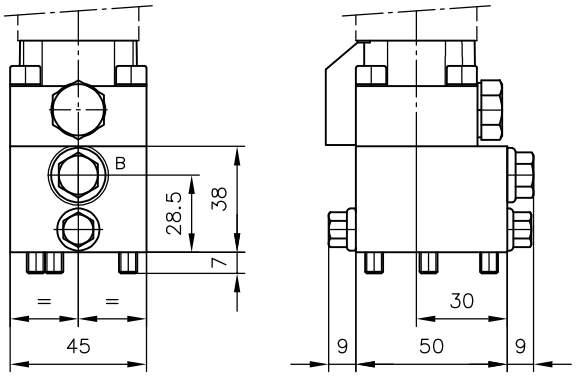
1 O-ring

Ports	O-ring NBR 90 Sh
P	17.12x2.62
A, R	13.95x2.62

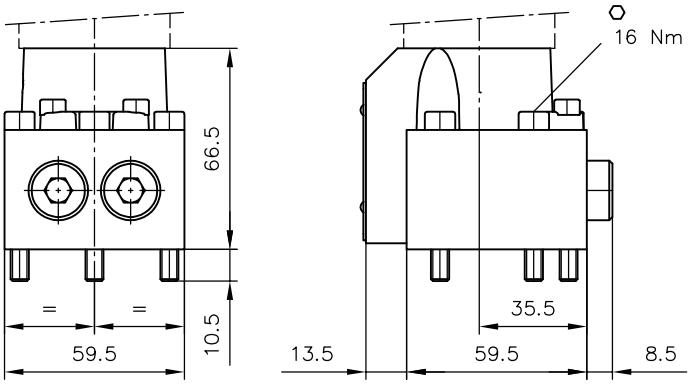
4.2 4/2 directional valve

Circuit symbol **4, Z 4**

Size **1**



Size **22**

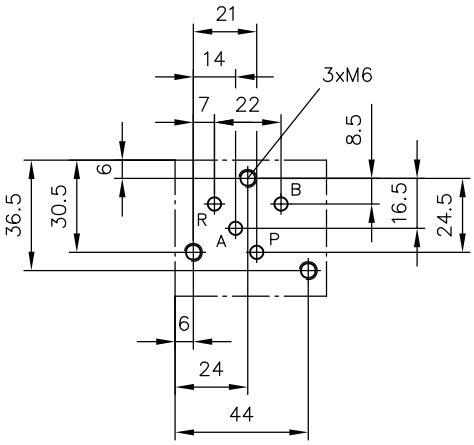


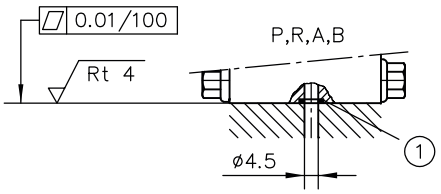
NOTICE

Further dimensions see Chapter 4.1, "2/2 and 3/2 directional valves"

Hole pattern of the base plate

Size **1**

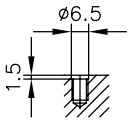




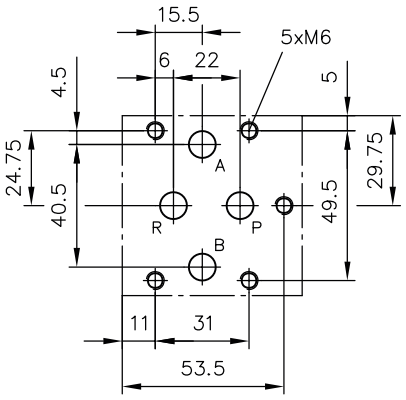
1 O-ring

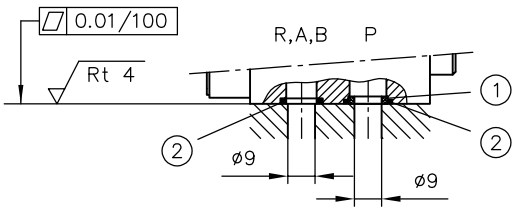
Ports	O-ring NBR 90 Sh
P	8x1.5
A, B, R	5x1.5

Counterbore of the mounting thread:



Size **22**





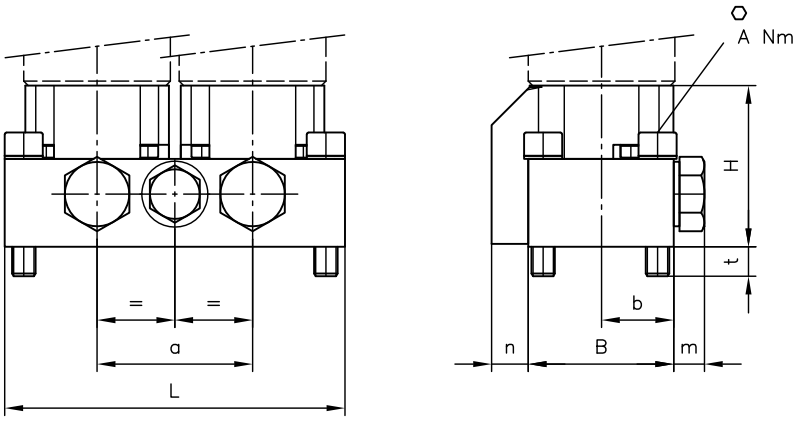
1 Supporting ring
2 O-ring

Ports	O-ring TPU 90
P	12.42x1.78
A, B, R	10.00x2.20

4.3 3/3 directional valve

Circuit symbol **21**

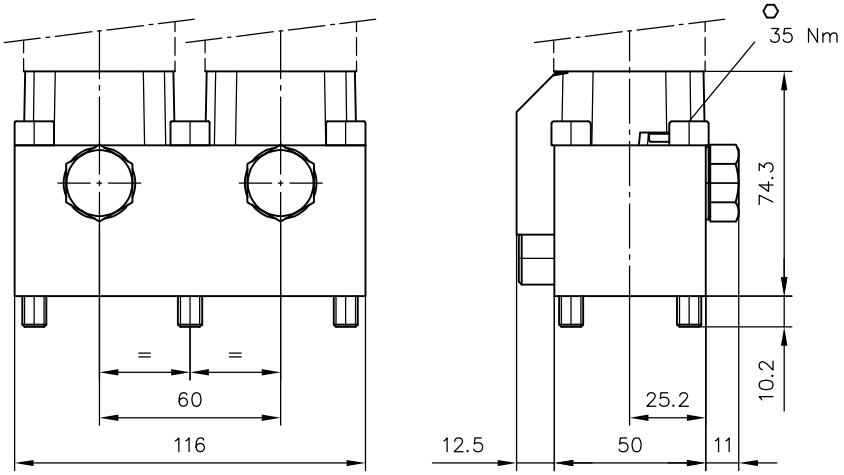
Size **0, 1, 2, 3**



Size	L	B	H	a	b	m	n	t	A
0	75	32	27	38	16	7	9.5	4	6.5
1	92	40	35	45	20	8.1	10	9	9.5
2	116	50	55	53	25 if B 50	10.5	12.5	10	23
3	144	70	70	72	35	17	21.5	10	46

Circuit symbol **39**

Size **22**

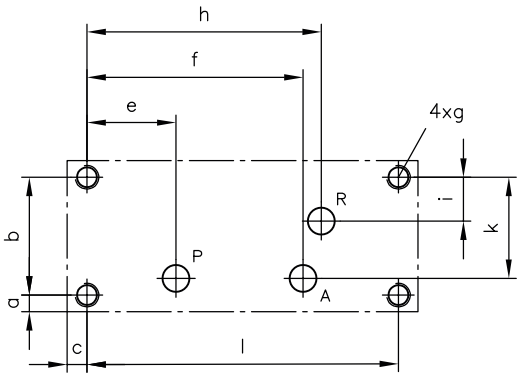


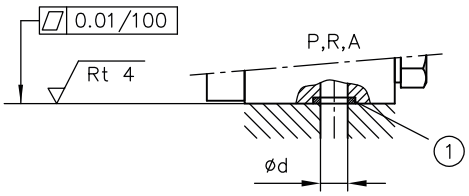
NOTICE
Further dimensions see Chapter 4.1, "2/2 and 3/2 directional valves"

Hole pattern of the base plate

Circuit symbol **21**

Size **0, 1, 2, 3**





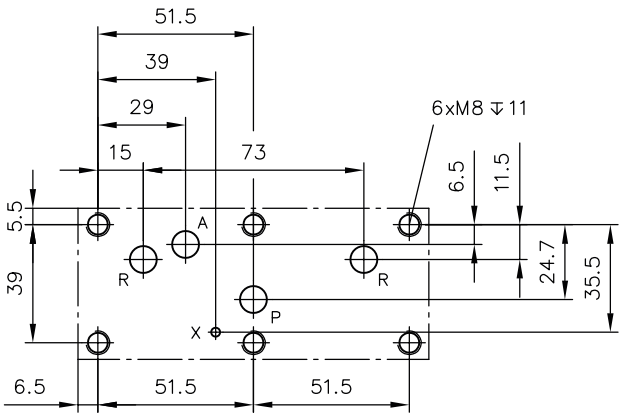
1 O-ring

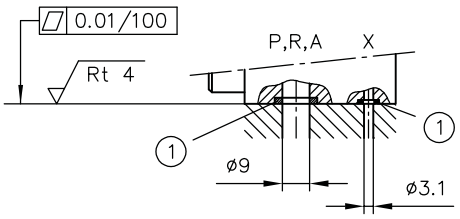
Ports	O-ring NBR 90 Sh			
	Size			
	0	1	2	3
P	6x1.5	8x1.5	14x2	17.12x2.62
A, R	6x1.5	5x1.5	10x2.2	13.95x2.62

Size	a	b	c	∅d	e	f	h	i	k	l	g
0	4	24	4.5	3.5	20	49	52	7	23	66	M5
1	5	30	5	4.5	26	61	68	8	28	82	M6
2	5.5	39	6.5	9	29.5	77.5	77.5	14.5	39	103	M8
3	8	54	8	12	44	84	90	16	55	128	M10

Circuit symbol **39**

Size **22**





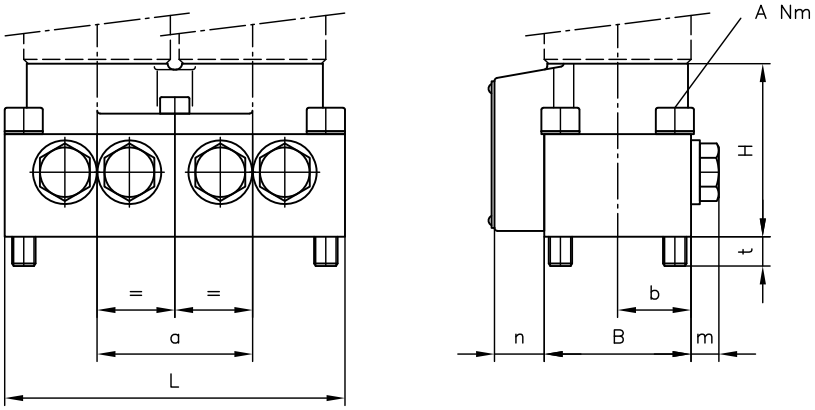
1 O-ring

Ports	O-ring
P	12.42x1.78 HNBR 90 Sh
A, R	9.25x1.78 AU 90 Sh
X	3.68x1.78 AU 90 Sh

4.4 4/3 directional valve

Circuit symbol **22**

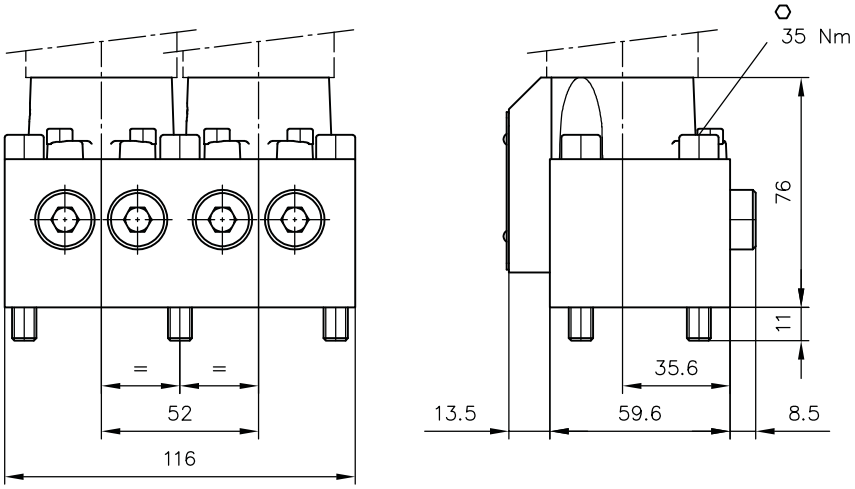
Size **0, 1, 2, 3**



Size	L	B	H	a	b	m	n	t	A
0	75	32	31	33	16	7	9.3	5	6.5
1	92	40	40	45	20.5	8.8	11.5	9	9.5
2	116	50	59	53	25	11	17	10	23
3	144	70	70	64	35	16.5	22	10	46

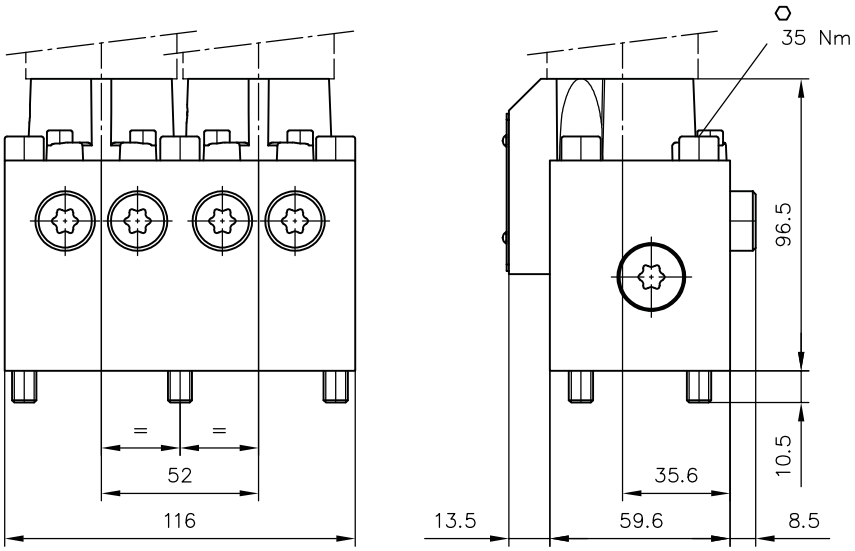
Circuit symbol **45**

Size **22**



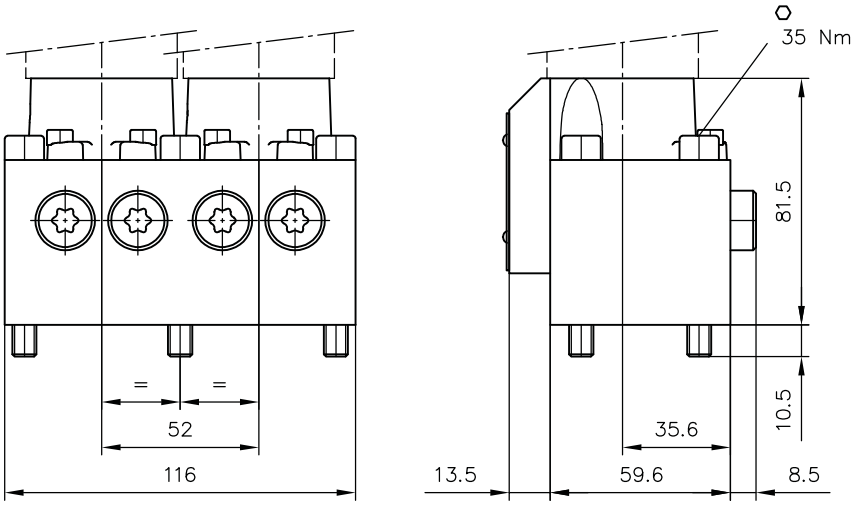
Circuit symbol **46**

Size **22**



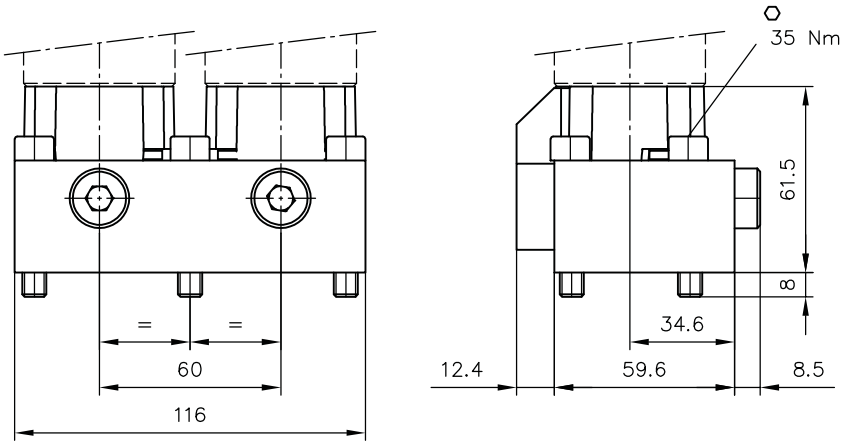
Circuit symbol **47**

Size **22**



Circuit symbol **48**

Size **22**

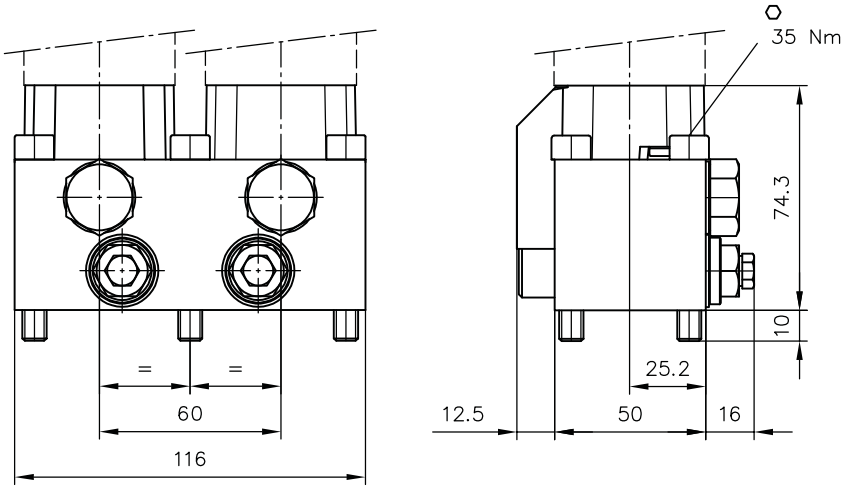


INFORMATION

Adapter plate Z 15, see Chapter 4.6, "Adapter plate", page 54

Circuit symbol **49**

Size **22**



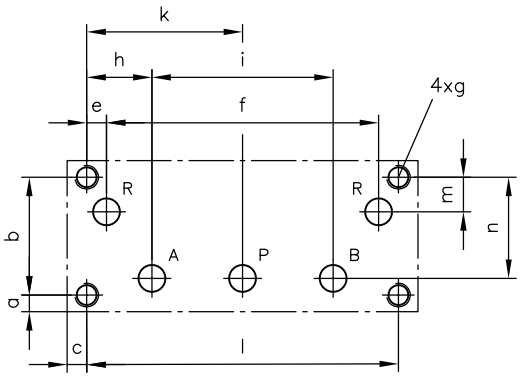
NOTICE

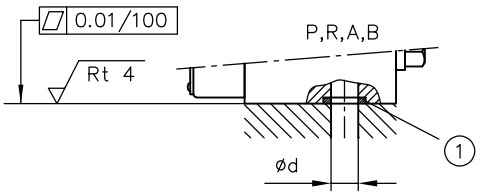
Further dimensions see Chapter 4.1, "2/2 and 3/2 directional valves"

Hole pattern of the base plate

Circuit symbol **22**

Size **0, 1, 2, 3**





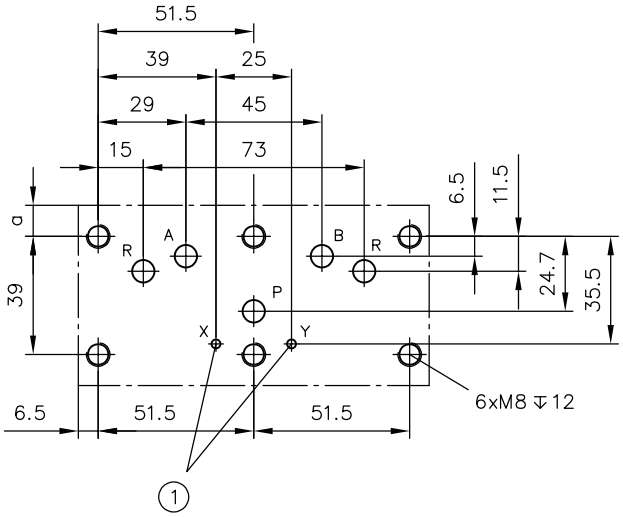
1 O-ring

Ports	O-ring NBR 90 Sh			
	Size			
	0	1	2	3
P	6x1.5	8x1.5	14x2	17.12x2.62
A, R	6x1.5	5x1.5	10x2.2	13.95x2.62

Size	a	b	c	∅d	e	f	h	i	k	l	m	n	g
0	4.2	24	4.5	3.5	6	54	14	38	33	66	6.8	18.8	M5
1	5	30	5	4.5	6	70	17	48	41	82	8	23	M6
2	5.5	39	6.5	9	6.5	90	21.5	60	51.5	103	11.5	33.5	M8
3	8	54	8	12	9	110	26	76	64	128	14	47	M10

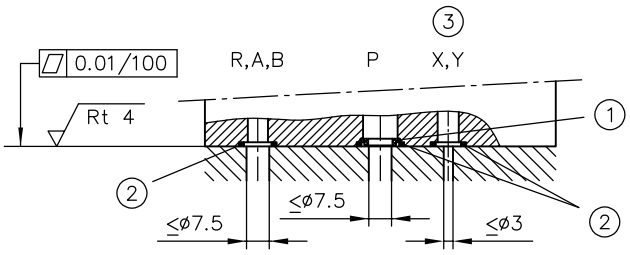
Circuit symbol **45, 46, 47, 48, 49**

Size **22**



1 X and Y port not with circuit symbol 45 and 46

Type	a
G 45	10.3
G 46	10.3
G 47	10.3
G 48	5.3
G 49	5.5



1 Ring

2 O-ring

3 X and Y port not with circuit symbol 45 and 46

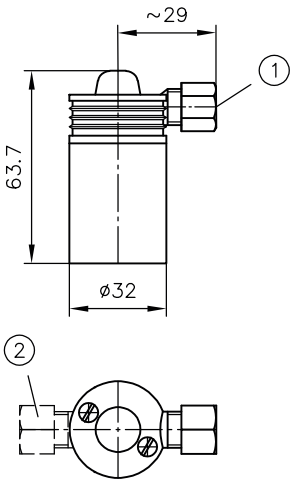
Type	O-ring TPU 90 Sh			
	Ports			
	P	A, B	R	X, Y
G 45	12.42x1.78	9.25x1.78	9.25x1.78	
G 46			18.77x1.78	
G 47			9.25x1.78	9.00x1.50
G 48				3.68x1.78
G 49				

4.5 Actuation

4.5.1 Solenoid actuation

Size **0**

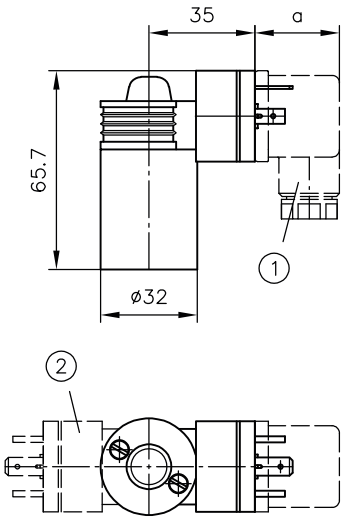
Coding **G**



1 Suitable for cable ∅6

2 Connector can be mounted offset by 180°

Coding **A, N, WG**



1 Can each be mounted offset by 90°

2 Connector can be mounted offset by 180°

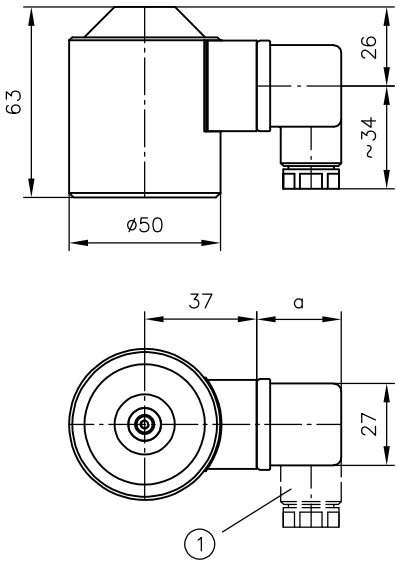
Coding	a
N	26.5
WG	33

NOTICE
For solenoid actuation size 1 see D 7300-12

Size **2, 22**

Coding **G, WG**

Circuit symbol **R2, S2, 3, Z 3, 21, 22, 39, 49**

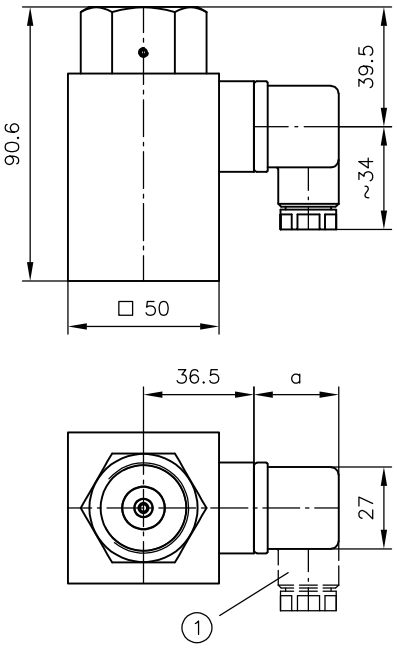


1 Can each be mounted offset by 90°

Size **22**

Coding **G, WG**

Circuit symbol **45, 46, 47, 4, Z4**

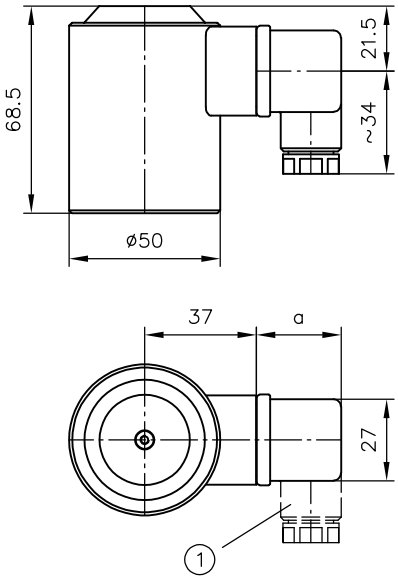


1 Can each be mounted offset by 90°

Size **22**

Coding **G, WG**

Circuit symbol **48**

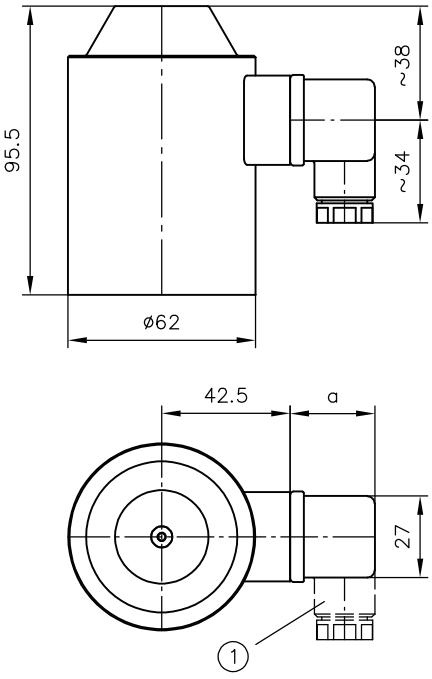


1 Can each be mounted offset by 90°

Solenoid	a
G	28
WG	34.5

Size **3**

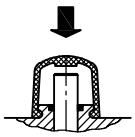
Coding **G, WG**



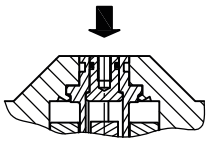
1 Can each be mounted offset by 90°

Manual override

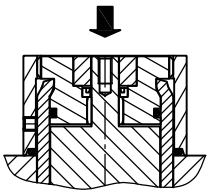
Size **0**



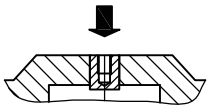
Size **2, 22** for G R2, G S2, G 3, GZ 3, G 21, G 22, G 39, G 49



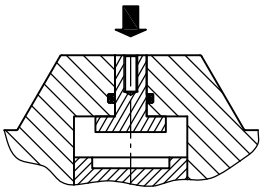
Size **22** for G 45, G 46, G 47, G 4, G Z4



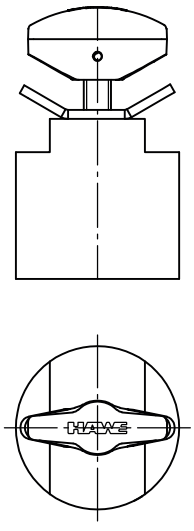
Size **22** for G 48



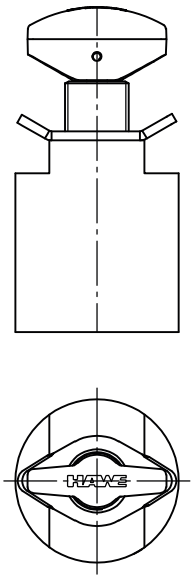
Size **3**



Coding **T**



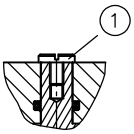
Coding **TT**



To actuate the valve:

► By pressing the magnetic pin protruding under the rubber cap, max. actuation force 35 N

► If necessary, push override pin in using a suitable pointed tool (e.g. screwdriver)

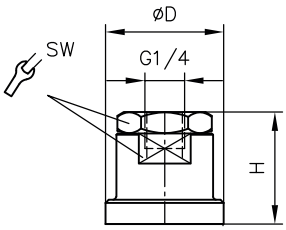


1 Manual override can be disabled manually by screwing in a screw M3x5 DIN 921

4.5.2 Further actuations

Hydraulic

Coding **H**

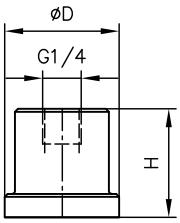


SW = Width across flats

Size	∅D	H	SW
0	32	44	27
1	39	37	27
2, 22	49	52	32
3	60	77	41

Pneumatic

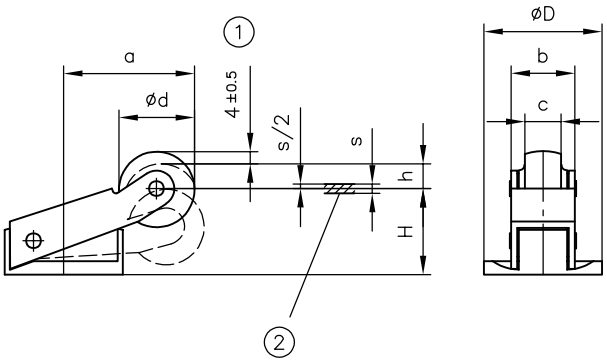
Coding **P**



Size	∅D	H
1	39	37
2, 22	49	41
3	60	52

Mechanical (sensing roller)

Coding **K**



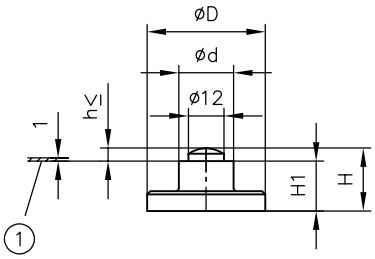
Size	∅D	H	∅d	a	b	c
1	39	28	25	42	21	12
2, 22	49	31	25	41	21	12
3	60	46	35	62.5	26	15

1 Free travel
2 Do not use as stop!

Size	Switching travel (mm)		
	Functional travel	Switching position range	Start of function
	h	s	H + h
1	10.5 ±0.5	3 ±0.5	38.5 ±0.5
2, 22	15.5 ±0.5	4 ±0.5	46.5 ±0.5
3	30 ±0.5	6 ±0.5	76 ±0.5

Mechanical (sensing pin)

Coding **T**

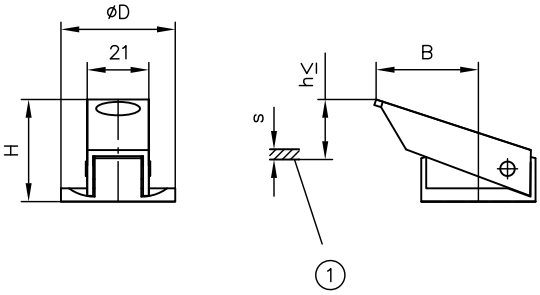


Size	∅D	∅d	H	H1	Functional travel (mm)
					h
1	39	18	20.5	16.5	4
2, 22	49	22	25.5	20.5	5

1 Do not use as stop!

Manual (sensing lever)

Coding **F**

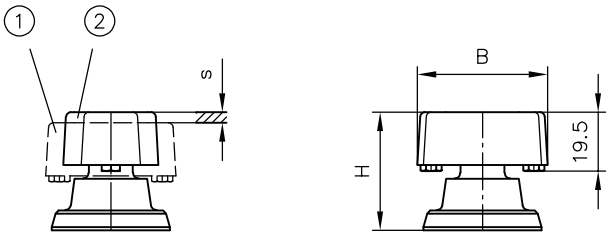


Size	∅D	H	B	Switching travel (mm)	
				Switching position range (mm) s	Functional travel (mm) h
1	39	37	34.5	3.5	20.5
2, 22	49	43	32	4	23.5
3	60	70	56.5	10	45

1 Do not use as stop!

Manual (rotary knob)

Coding **D**

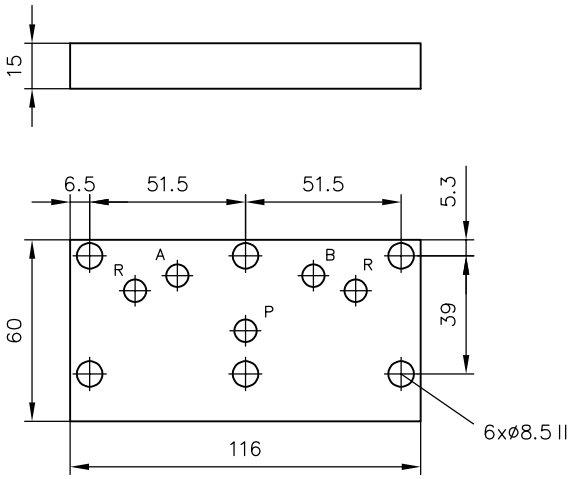


Size	H	B	Switching travel (mm)
			s
0	38	43	3.5
1	40	43	3.5
2, 22	47	52	5

1 Switching position a
2 Switching position 0

4.6 Adapter plate

Z 15



INFORMATION

for circuit symbol G48, see Chapter 4.4, "4/3 directional valve"

4.7 Single connection blocks for pipe connection

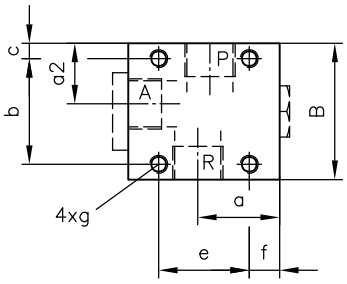
2/2 and 3/2 directional valves

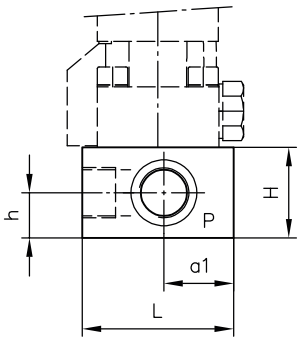
NOTICE

For 2/2 directional valve, port A is not present, otherwise same dimensions as 3/2 directional valve.

Size **0, 1**

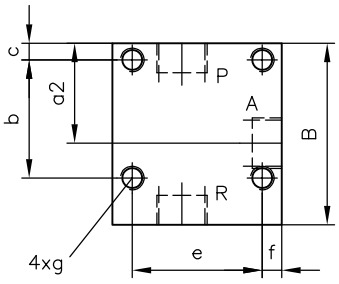
..-1/4, ..-1/4 C
..-3/8, ..-3/8 C

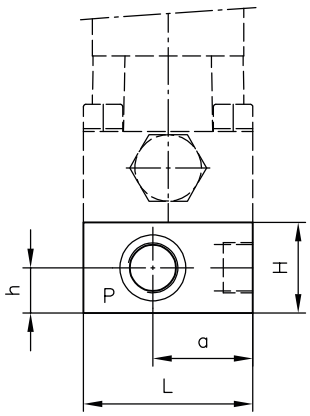




Size **2, 22, 3**

..-3/8, ..-1/2, ..-3/4
..-3/8 C, ..-1/2 C

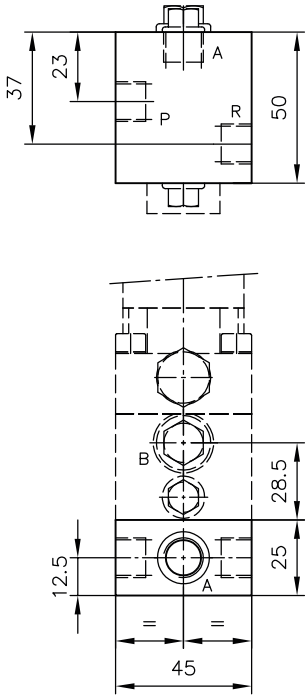




Size	L	B	H	a	a1	a2	b	c	e	f	g	h	Ports (ISO 228-1) P, R, A
0	40	36	25	16	16	18	28	4	24	4	M5, 6 deep	12.5	G 1/4
1	50	45	30	29	21	20	35	5	30	10	M6, 10 deep	15	G 1/4
	50	45	30	27	23	18	35	5	30	10		15	G 3/8
2, 22	56	60	30	33	--	33	39	5.5	43	6.5	M8, 10 deep	15	G 3/8
	56	60	30	33	--	27	39	7.5	43	6.5		15	G 1/2
3	70	80	40	43	--	40	54	18	54	8	M10, 10 deep	20	G 1/2
	70	80	40	41	--	40	54	18	54	8		20	G 3/4

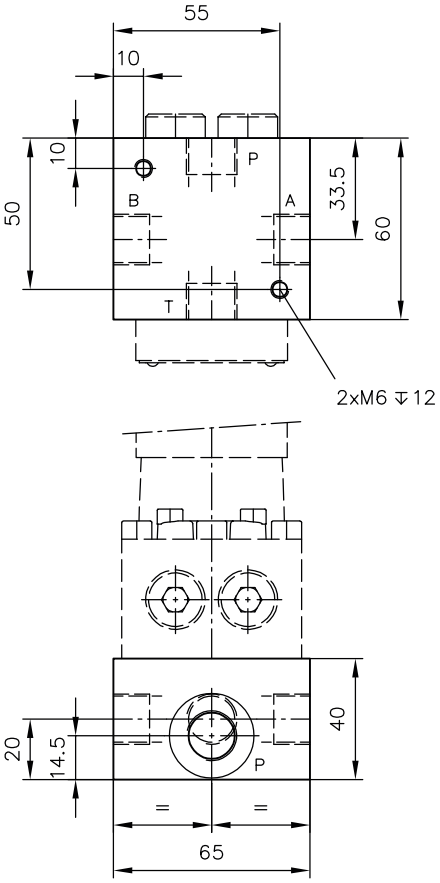
Size **1**

..4-1-1/4
..Z 4-1-1/4



Size **22**

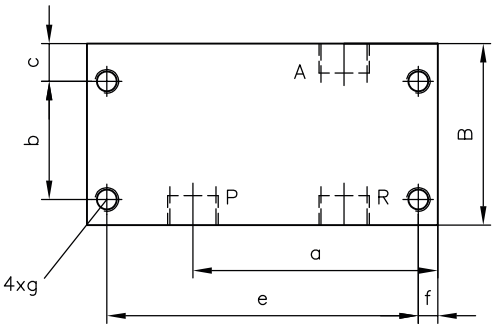
...4-22-3/8
...Z 4-22-3/8

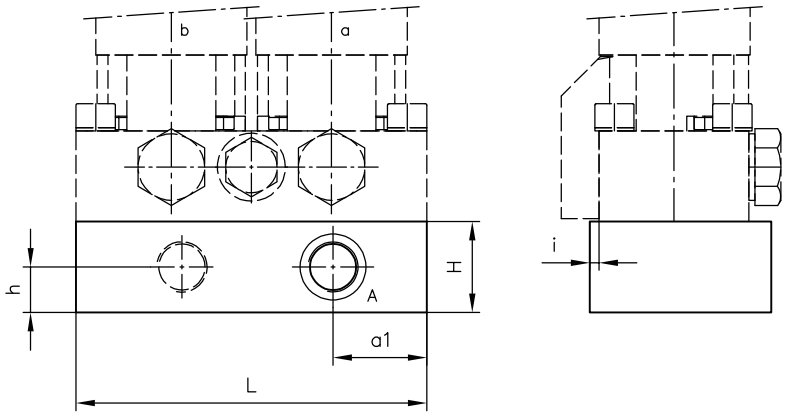


Size	Ports (ISO 228-1)	
	P, R, A, B	P, A, B, T
1	G 1/4	--
22	--	G 3/8

Size **0, 1, 2, 3**

..21-0-1/4 to ..21-3-3/4

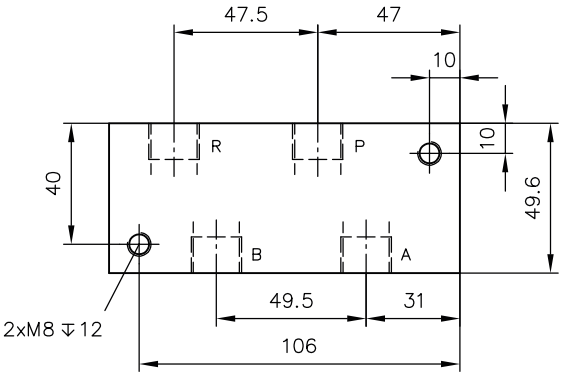


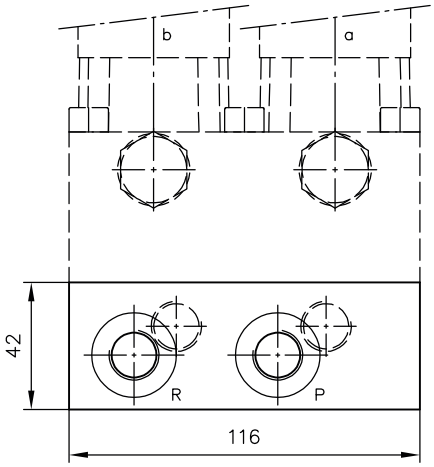


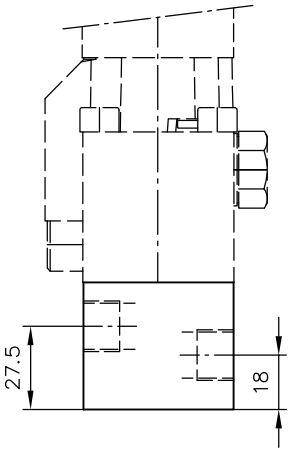
Size	L	B	H	a	a1	b	c	e	f	g	h	i	Ports (ISO 228-1) P, R, A
0	75	40	25	50	20	24	8.5	66	4.5	M5, 6 deep	12.5	12.5	G 1/4
1	92	50	30	62	22	30	7	82	5	M6, 10 deep	15	8	G 3/8
2	116	60	30	81	31	39	12.5	103	6.5	M8, 10 deep	15	3	G 1/2
3	144	80	40	92	46	54	18	128	8	M10, 12 deep	20	10	G 3/4

Size **22**

..39-22-3/8



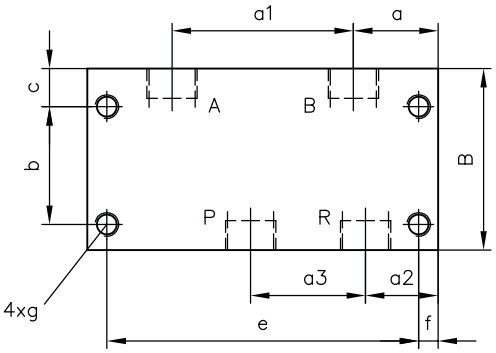


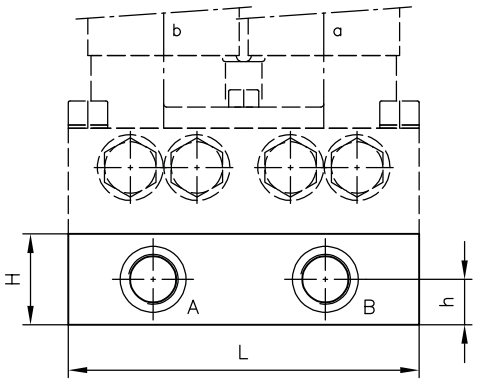


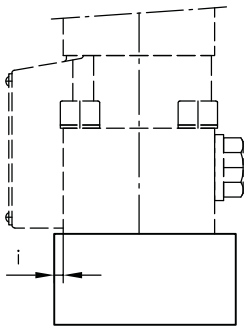
Size	Ports (ISO 228-1)
	P, R, A, B
22	G 3/8

Size **0, 1, 2, 3**

..22-0-1/4 to ..22-3-3/4





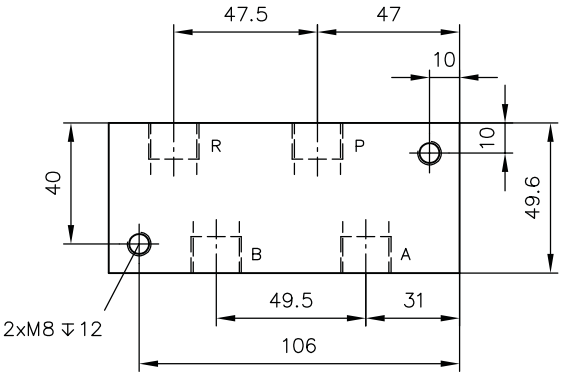


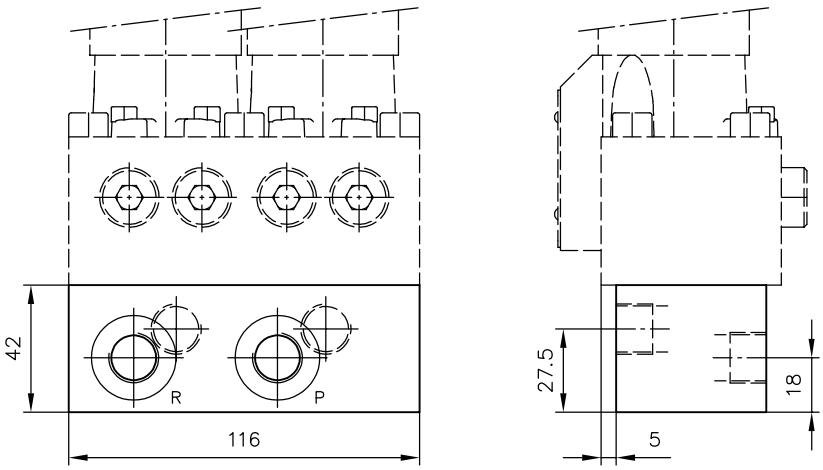
Size	L	B	H	a	a1	a2	a3	b	c	e	f	g	h	i
0	75	40	25	18.5	38	15	25	24	9	66	4.5	M5, 6 deep	11	7.5
1	92	50	30	21	50	21	30	30	7	82	5	M6, 10 deep	15	8
2	116	60	30	28	60	24	38	39	12.5	103	6.5	M8, 10 deep	15	3
3	144	80	40	34	76	29	43	54	18	128	8	M10, 12 deep	20	10

Size	Ports (ISO 228-1)
	P, R, A, B
0	G 1/4
1	G 3/8
2	G 1/2
3	G 3/4

Size **22**

..45-22 to ..49-22 -3/8

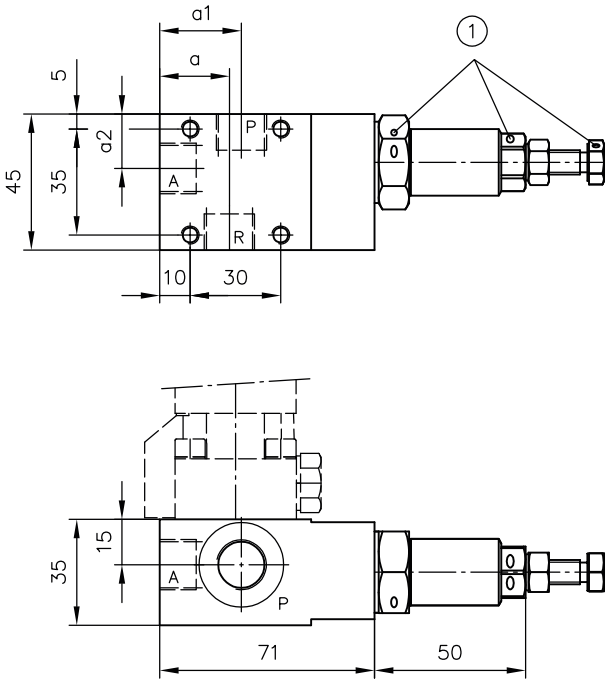




Size	Ports (ISO 228-1)
	P, R, A, B
22	G 3/8

Size **1**

..1/4 S, ..1/4 SR
..3/8 S, ..3/8 SR

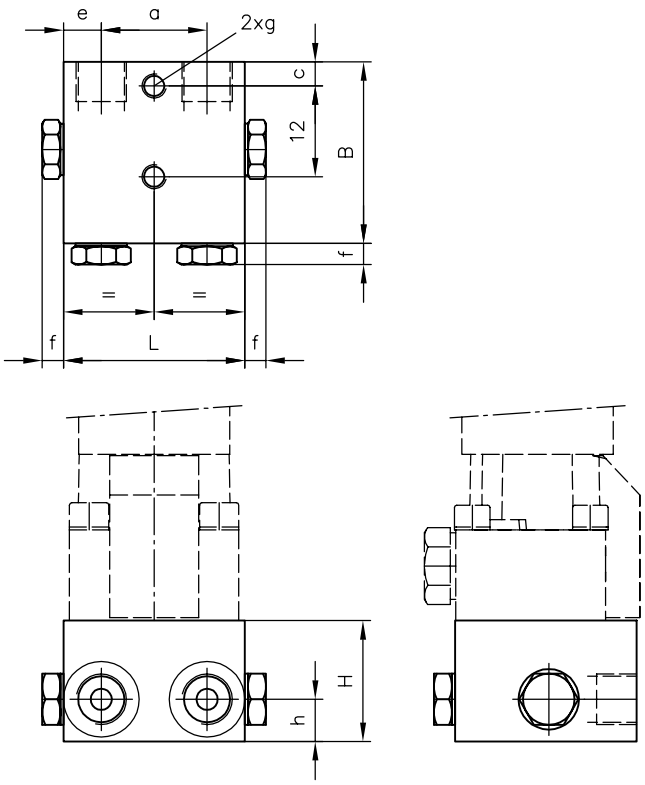


Coding	a	a1	a2	Ports (ISO 228-1) P, R, A
..-1/4 S ..-1/4 SR	21	29	20	G 1/4
..-3/8 S ..-3/8 SR	23	27	18	G 3/8

1 Sealing option

2/2 directional valves, connection block with check valves in Graetz circuit

..-1/4 G, ..-3/8 G
..-1/2 G



Size	L	B	H	a	b	c	e	f	g	h	Ports (ISO 228-1)
0	44	50	30	24	30	10	10	9	M5, 5 deep	14	G 1/4
1	54	50	35	34	25	7	10	9	M6, 10 deep	12	G 3/8
2	60	60	40	35	30	8	12.5	9	M8, 10 deep	14	G 1/2

5 Installation, operation and maintenance information

Observe the document B 5488 “General operating instructions for assembly, commissioning, and maintenance.”

5.1 Intended use

This product is intended exclusively for hydraulic applications (fluid technology).

The user must observe the safety measures and warnings in this document.

Essential requirements for the product to function correctly and safely:

- ► All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- ► The product must only be assembled and put into operation by specialist personnel.
- ► The product must only be operated within the specified technical parameters described in detail in this document.
- ► All components must be suitable for the operating conditions when using an assembly.
- ► The operating instructions for the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.
   ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

The product must be shut down correctly prior to disassembly (in particular in combination with hydraulic accumulators).

⚠ **DANGER**

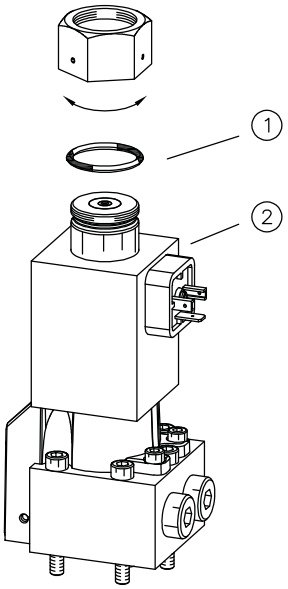
Sudden movement of the hydraulic drives when disassembled incorrectly

Risk of serious injury or death

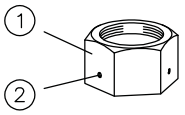
- ► Depressurise the hydraulic system.
- ► Perform safety measures in preparation for maintenance.

5.2.1 Adjusting the connector position or replacing the solenoid

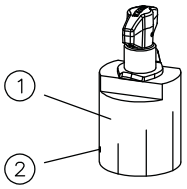
Example: **GZ 4-22**



1 O-ring 30x2 NBR 90 Sh
2 Solenoid



1 Nut
2 Grub screw



1 Manual override
2 Grub screw

Plug position can be adjusted individually:

- ► Remove both grub screws.
- ► Undo nut size 36 or manual override T/TT.
- ► Position or replace the solenoid.
- ► Re-tighten nut size 36 or manual override T/TT. (Tightening torque 5+1 Nm)
- ► Screw in both grub screws (hand-tight).

SW = Width across flats

Solenoid: see Chapter 6.1, "Accessories, spare and individual parts"

NOTICE
G 45 to G 47, Z, Z 4: solenoid aligned in increments of 90°; circuit symbol R 2, S 2, 3, Z 3, 21 and 22, 39, and 49: connector position rotated 120° to the outside, in the case of 48 rotated 90° to the outside, can be done by dismantling the flange and the compact solenoid. See spare parts list in PartsMan.

5.3 Operating instructions

Observe product configuration and pressure/flow rate.

The statements and technical parameters in this document must be strictly observed.
The instructions for the complete technical system must also always be followed.

NOTICE

- ► Read the documentation carefully before usage.
- ► The documentation must be accessible to the operating and maintenance staff at all times.
- ► Keep documentation up to date after every addition or update.

CAUTION

Overloading components due to incorrect pressure settings.
Risk of minor injury. Parts may burst or fly off, and uncontrolled leakage of hydraulic fluid.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the product. Contamination can cause irreparable damage.

Examples of fine contamination include:

- Swarf
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

NOTICE

New hydraulic fluid from the manufacturer may not have the required purity.
Damage to the product is possible.

- ► Filter new hydraulic fluid to a high quality when filling.
- ► Do not mix hydraulic fluids. Always use hydraulic fluid that is from the same manufacturer, of the same type, and with the same viscosity properties.

For smooth operation, pay attention to the cleanliness level of the hydraulic fluid (cleanliness level see Chapter 3, "Parameters").

Additionally applicable document: D 5488/1 oil recommendations

5.4 Maintenance information

Check regularly (at least once a year) by visual inspection whether the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

Clean the surface of the device regularly (at least once a year) (dust deposits and dirt).

6 Other information

6.1 Accessories, spare and individual parts

To purchase spare parts, please see HAWE Hydraulik interactive contact map.

6.1.1 Standard additional elements

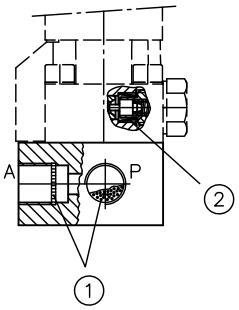
Protection of directional seated valves from coarse, occasional contamination

Directional seated valves are largely insensitive to the microfine, suspended contamination that is always present in hydraulic oil. Coarse, occasional impurities entrained by the flow of oil, such as torn particles of cuffs, scaling, swarf etc., can however lead to abrupt disturbances, if such a particle gets stuck in the valve gap and prevents the valve from closing. Therefore, the valves are already largely protected at the factory by built-in screen filters.

For additional preventative protection, screen discs HFC 1/4 or HFC 3/8 according to D 7235 are screwed into (as standard) the connection plates according to Chapter 4.7, "Single connection blocks for pipe connection" for the valve size 0 at A(B) and for valve size 1 at P and A(B). Sizes 2 and 3 with connection threads G 3/8, G 1/2 and G 3/4 can be retrofitted individually.

The screen filters are no substitute for conventional hydraulic filters. However, as practice shows, they are sufficient to protect small hydraulic systems against malfunctions. If such malfunctions occur, the first step should be to check the screen filters.

For clearer overview, these screen filters are not shown separately.

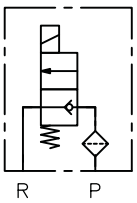


1 Screen filters HFC according to D 7235
2 Screen filters

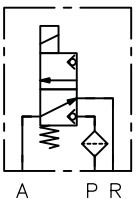
Circuit symbol

Single valves

2/2 directional valve

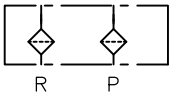


3/2 directional valve

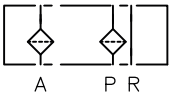


Connection plates

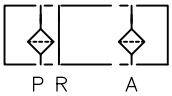
2/2 directional valve



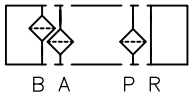
3/2 and 3/3 directional valve



4/2 directional valve

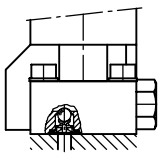
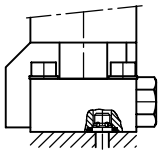


4/3 directional valve



6.1.2 Additional elements for retrofitting

Additional elements for affecting the switching function, inserted into port P or R

Coding	Comment	Installation drawing
R	The check valve prevents uncontrolled pressure feedback or oil return flow from R → P or A → P when, for example, multiple valves are connected in a parallel circuit and the supply pressure at P drops below the consumer pressure at A (idle circulation or activation of a further consumer with at low pressure demand). Pressure reduction during such switching is prevented.	Check valve or orifice each in P 
B..	The orifice acts to limit flow rate and should be used when flow rates greater than Q_{max} can occur when switching from P → A(R): Hydraulic accumulator on pump side P or for hydraulic pilot control of directional spool valves and control oil from main line with high flow rate.	
S	Check valves can be installed in the reflux outlets R of the 3/2-way valves of sizes 0 and 1. In systems with multiple valves in a parallel circuit, they prevent pressure surges from the shared reflux line from propagating into non-actuated, easily moved consumers with no load and thus causing uncontrolled extension action where there is a connection between A → R. Such pressure surges can occur as a result of switching procedures. The check valves are not suitable for blocking off the flow of hydraulic oil, which can occur as a result of switching combinations with other valves at R.	Return pressure stop in R 

6.1.3 Order coding for individual parts

Excitation system (replaceable solenoid) Size 22 for G 4, GZ 4, G 45, G 46, G 47:		**Male connector:**	
Coding	**Order no.**	**Coding**	**Order no.**
G 12, L 12, X 12, L5K 12	4704 4112-00	G ..	6217 0002-00
G 24, L 24, X 24, L5K 24	4704 4113-00	L ..	6217 8024-00
WG 110, G 98, X 98	4704 4114-00	WG ..	6217 6002-00
WG 230, G 205, X 205	4704 4169-00	L 5 K ..	6217 8088-00
		L 10 K ..	6217 8090-00

6.2 Versions for special media

- HFA (water/glycol solution as per VDMA 24317)
  To prevent corrosion, important functional parts are made of stainless steel (valve balls, seat, switching pin, etc.) or are hardened using the Tenifer technique (housing, tapped plug, etc.). Seals are partly made of FKM and NBR as standard for this variant.
  Only the 2/2, 3/2, and 4/2 directional valves are available (circuit symbols R 2, S 2, 3, Z 3, see Chapter 2.1, "Basic type (actuation) and size").

  Type designation: G 3-0-G 24-HFA

Size	Pressure p_{max} (bar)	Flow rate Q_{perm} (l/min) approx. with reflux counter-pressure		Comment
		1 bar	2 bar	
0	400	3	3	A low counter-pressure in the return line is often achieved as the weight pressure of the liquid by placing the tank at the highest point of the system.
1		5	6	
2		14	18	
3		36	45	

  Size 22 not possible in HFA version.

  To avoid cavitation damage, the flow rate of valves with return connection (3/2 and 4/2 directional valves as well as 2/2 directional valves in bypass circuit to the tank) must be limited by upstream throttles (self-manufactured cascade throttles or throttle sections by means of helically wound pipeline with a narrow diameter) when used in storage circuits in such a way that the previously specified permissible flow values are not exceeded at the highest possible pressure for operation.

6.3 Configuration and planning instructions

The specified nominal powers are approximate reference values which may slightly differ depending on the voltage and solenoid manufacturer. The cold current can be calculated: $I_{20} = P_N / U_N$ (see examples).

Layout instructions

- DC voltage: The voltage particulars (solenoid specification) should match the supply voltage actually available (a lower supply voltage will lead to a reduction of force, a higher supply voltage will lead to an unacceptably high temperature at the solenoid, tolerance ± 5 to 10%).
- AC voltage: The voltage particulars should match the supply voltage actually available (50/60 Hz). The use of a corresponding rectifier circuit in the line connector results in a solenoid voltage of approx. 0.9 U_{AC} - 2 V. The respective direct current solenoids used can be seen the table (e.g. for 110 V AC 50 Hz solenoid with U_N = 98 V DC), see Chapter 2.4.1, "Solenoid voltage and connector"

NOTICE
Note (for all versions): For block circuits, a duty cycle of only up to max. 40% is permissible; actuating two adjacent solenoids at the same time should also be avoided.

References

Additional versions

- Directional seated valve type G with interchangeable solenoid: D 7300-12
- Directional seated valve type NG, NGW and others: D 7300 N
- Valve bank (directional seated valve) type VB: D 7302
- Directional seated valve type ROLV: D 8144

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